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VOLUME 2, 1918

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SURGICAL CLINICS OF CHICAGO

Volume 2 Number 1

CLINIC OF DR. E. WYLLYS ANDREWS AND DR. CHARLES LOUIS MIX

Mercy Hospital

A CASE OF DUODENAL ULCER; ITS DIAGNOSIS AND TREATMENT

Summary: Dr. Mix.—History and examination of present case, interpretation of the findings; differentiation of gastric and duodenal ulcer, appendicitis, and certain infections of the biliary tracts; duodenal and gastric ulcers occurring coincidently in the same patient, the diagnosis; indications in the present case. Dr. Andrews.—Exploratory incision, discovery of chronic ulcer as expected from the results of the pre-operative examination; technic of gastrojejunostomy by the Billroth three-layer method; necessity for occlusion of pylorus; demonstration of a safe and simple technic.

HISTORY

Dr. Mix (October 11, 1917): The patient, a male twenty-three years old, single, entered the hospital complaining of stomach trouble.

Previous Illness.—Measles at the age of four; appendectomy at the age of sixteen. There have been no other illnesses.

Family History.—His father and mother are living and well. He has a brother who weighs about 40 pounds more than he. He has two sisters who are living and well, and both are heavier than the patient.

Venereal History.—Absolutely negative.

Present Illness.—His present trouble began about three and a half years ago with slight eructations of food—about two mouthfuls came up every morning following his breakfast. This continued for about six months, after which time he began to be troubled with a burning sensation in the epigastrium, which came on fifteen minutes after eating and lasted a variable length of time, sometimes only fifteen minutes and sometimes an hour. He does not remember the early history of his symptoms with any degree of clearness. He does remember, however, that the burning was not accompanied by nausea or vomiting, although there was regurgitation.

This burning sensation lasted for about one and a half years, at the end of which time he went to a Texas city, where a diagnosis of gastric ulcer was made, and where he was treated for a time. At first he was given no food whatever, and subsequently he was given only milk. He remained in the hospital undergoing this treatment for a period of about six weeks. At the end of that time, feeling no better and being somewhat discouraged, he returned to his home unimproved. He remained in his home for a year without any treatment, feeling miserable most of the time and being quite incapable of working. By reason of the fact that he was not improved when treated in the hospital in Texas, he began to doubt very much the diagnosis of gastric ulcer.

His present difficulty consists chiefly of a "heavy distress" in the epigastrium, somewhat painful, though more distressing than actually painful. The distress and pain do not radiate into the thorax. They are made worse by the ingestion of food and are not relieved by anything except bicarbonate of soda and oxid of magnesia. At the present time he also complains of nausea, though he does not vomit, and of eructations of sour and acrid stomach contents. He feels very weak and says that during the last two years he has lost about 20 pounds in weight. At the present time he weighs under 120 pounds.

Examination.—The main point in the patient's early history is the operation of appendectomy six years ago, when he was sixteen years of age. Cross-examination of the patient as to his symptoms at that time rather substantiates the diagnosis of appendicitis, although he states that when the appendix was removed it was not very much diseased. Nevertheless the removal of the appendix was followed by perfect health for a period of two and a half years. During this period his stomach never gave him a moment of concern.

About three and a half years ago he began having trouble with his stomach. The early history of his complaints is rather hazy in his mind, the thing that is best remembered being the eructation of two mouthfuls of food each morning after his breakfast. He does not recall that at the beginning of his trouble he had very much pain. In the course of time, however, pain developed, and it came rather promptly after eating, from fifteen minutes to one and a half hours after meals. Further cross-examination discloses the fact that at first the location of this pain was, for the most part, in the epigastrium; second, that the pain did not radiate into the thorax; third, that the time of its occurrence was within a short time after eating; fourth, that food made the pain worse rather than better; fifth, that the pain was a steady, burning pain, and not rhythmic, wave-like, or colicky in character.

He also complains of gas and belching. These symptoms are common to all abdominal diseases associated with hyperacidity, whether the disease be ulcer of the stomach or duodenum, biliary tract infections, adhesions, gastroptosis with hyperacidity, or appendicitis with hyperacidity. In all of these conditions the effect of the hyperacidity upon the patient is to induce that patient to believe that there is gas in the stomach. In order to get rid of the fictitious gas, which is really nothing but the sensation caused by the irritation of excessive acid, the patient makes numerous endeavors to belch, and in the course of time may swallow sufficient air to make it possible to get a little back. We know positively, however, that these belchers do not have great masses of gas in the stomach, that in every single instance, when they are given barium and buttermilk and a fluoroscopic examination is made, there is found only a small bubble of gas in the fundus of the stomach, the so-called "Magenblase." We therefore may at once dismiss these two symptoms of gas and belching complained of by this patient as having absolutely no diagnostic value other than indicating the probable presence of excessive secretion of acid.

Another extremely important point in this patient's history is the matter of regurgitation and vomiting. It is our experience that patients with ulcers of the duodenum not associated with complications do not vomit. This patient had regurgitation of food and nausea, although he did not actually vomit. This is indicative of the presence of gastric rather than duodenal ulcer. In those cases in which ulcer of the duodenum and vomiting are associated we find something besides the duodenal ulcer at fault. It is either a periduodenitis, an attempt at perforation, an inflammation of the peritoneum, or an infected gall-bladder, or a complicating ulcer that is responsible for such regurgitation, nausea, or vomiting. In the cases where gastric ulcer is the complicating factor food contents alone are usually vomited. If, on the other hand, the biliary tract is at fault, or there is some inflammation of the peritoneum, then there is a tendency toward the vomiting of bile. In the case of this patient only stomach contents were regurgitated. This raises the presumption strongly in favor of a gastric ulcer.

Associated with pain in the epigastrium in his case is the location of tenderness in the epigastrium. This tenderness is not absolutely sharply localized as it is in the ordinary case of gastric ulcer. Neither is it located as far to the right as it usually is in the presence of a duodenal ulcer. In the case of this patient the epigastric tenderness can be accepted merely as a fact without our being able to say that it points either toward a gastric or duodenal ulcer exclusively. On the whole, it is more indicative of a gastric than a duodenal ulcer.

There is another symptom which is of importance in a way, because the patient complains of intense constipation, which has persisted for the three and a half years that he has been ill. Such constipation raises the presumption of the presence of gastric or duodenal ulcer as against the presence of a biliary tract infection. Patients with gall-stone disease are, as a rule, not troubled with constipation. Patients with gastric or duodenal ulcer are almost invariably so afflicted.

Very important in the history of this patient's case are certain negative facts. Throughout the three and a half years there has been no evidence of any infection. He has never had fever, headaches, or inflammations or infections of any of his joints.

His tongue has not been coated. He has had no so-called "bilious spells." In other words, there is no evidence that this patient's abdominal disease is a focal infection, in the sense that it is a focus of distribution of septic material or of toxemia. When a patient has an infected gall-bladder he has a center for the distribution of infective material. When a patient has an ulcer of the stomach or of the duodenum his ulcer is not a focus for septic distribution. In this respect the symptomatology of biliary tract infections, on the one hand, and of ulcer cases, on the other hand, is very sharply contrasted. Both biliary tract infections and ulcers are the results of infection, but biliary tract infections are not merely foci of the reception of the infection, they become also foci of distribution. Gastric and duodenal ulcers are merely the end-products of infection. They never become foci of distribution. Consequently, an ulcer of the stomach and duodenum is not accompanied by headaches, temperature, various infections of the joints, coated tongue, or any signs of sepsis. The absence of such infectious signs in this patient's case raises a strong presumption against the diagnosis of biliary tract infection.

This presumption, moreover, is further strengthened by the absence of icterus. To be sure, large numbers of biliary tract infections exist without icterus, but the absence of icterus, the presence of constipation, and the absence of signs of sepsis, all point away from the gall-bladder toward the stomach and duodenum.

Lastly, there is the matter of this individual's weight. During the last two years he has lost 20 pounds, and he weighs at least 25 or 30 pounds under what he should weigh if his weight were normal. We can account for this loss not by infection, but only by starvation, either voluntary or forced, or by lack of assimilation. In the absence of signs of infection such weight-loss points rather strongly toward organic disease of the stomach and duodenum.

Some further considerations are important in connection with this case; namely, those considerations arising out of the union of both gastric ulcer and duodenal ulcer in the same patient. We have been encountering with greater frequency of late, possibly because of more careful surgical examination at the time of operation and partly because of more careful analysis of the symptoms, cases in which both ulcers of the duodenum and stomach are simultaneously present. When the ulcer of the duodenum develops first (and these cases are clearcut) the symptomatology consists chiefly of pain to the right of the epigastrium associated with tenderness in the duodenal area. The pain comes on one to two hours after meals and is relieved by the taking of food. When, in the presence of such an ulcer of the duodenum, a gastric ulcer develops, the symptomatology of the gastric ulcer immediately comes to the front and completely disguises the symptomatology of the duodenal ulcer. Indeed, the gastric ulcer is a complete camouflage for the duodenal ulcer. The pain of a gastric ulcer comes on immediately after meals and runs over, merges into, and becomes continuous with the pain of the duodenal ulcer, coming one to two hours after meals. The vomiting or regurgitation of the gastric ulcer replaces the absence of vomiting in the duodenal ulcer and so disguises the latter diagnostic symptom. Constipation is a prominent feature in both conditions, and affords us no means of differentiation. The presence of ulcer of the stomach brings about pain on the taking of food, even if the ulcer of the duodenum is present at the same time. The pain of ulcer of the duodenum is relieved by the taking of food. If both gastric and duodenal ulcers are simultaneously present there will be pain on taking of food and no relief whatever when food is taken. Thus again the symptomatology of gastric ulcer will cover that of duodenal ulcer.

If in a given case, therefore, we encounter first the symptomatology of duodenal ulcer, and then in the course of time find that it gives place to the symptomatology of gastric ulcer, it is a very simple matter indeed to make a double diagnosis, and to say definitely that the duodenal ulcer was the first ulcer and that the gastric ulcer developed at such and such a time.

On the other hand, if the gastric ulcer is the first to develop, and the duodenal ulcer develops subsequently, we have no means whatever of making a double diagnosis. The more positive symptoms of the gastric ulcer will absolutely cover up and conceal the underlying duodenal ulcer. In such a case the only possible way of discovering the presence of a duodenal ulcer is by x-ray examination of the duodenal cap.

This double diagnosis of gastric and duodenal ulcer must always be borne in mind in any given case. The association of both gastric and duodenal ulcer is extremely common in the same patient. Quite a number of pure duodenal ulcers occur and quite a number of cases of pure gastric ulcer, but there is a large number of patients who have both ulcers present. By way of summary, when gastric ulcer is added to duodenal ulcer the diagnosis is easily made. On the contrary, when duodenal ulcer is added to gastric ulcer, no suspicion of it will enter the examiner's mind except such suspicion as may be aroused by the fluoroscopic examination or the skiagrams.

Diagnosis.—In a case of this sort the first procedure in the diagnosis, after careful examination into the history, is the determination of the acidity of the stomach contents and the presence or absence of blood in the gastric contents or stools. The Ewald test-meal was given this patient upon entrance. This showed a total acidity of 53, free hydrochloric acid of 37. Some mucus was found in the gastric juice, gastric in origin, although the specimen was mildly soiled by a little mucus which had been swallowed. The microscopic examination showed no red blood-cells, but a large number of starch granules and an occasional yeast cell. The stomach contents showed no blood. Examination of the meat-free feces made the same day showed blood to be present. Examination of the urine gave a specific gravity of 1011, faintly acid reaction, absence of albumin and sugar. The urine contained no red blood-cells, casts, or pus. Examination of the blood showed 4,900,000 red cells, 9400 leukocytes, and 80 per cent. hemoglobin.

After these laboratory findings were obtained the patient was sent to the x-ray room for further examination. The fluoroscopic examination showed the barium and buttermilk passing freely down the esophagus into the stomach. In the stomach the barium sank to a very low level, almost to the left iliac fossa, because of the great elongation and downward displacement, which is of the fishhook type. While the fluoroscopic examination was being made the pylorus was manipulated by pressure on the abdomen. It was found to be rather fixed. Examination of the movements of the stomach showed an exaggerated hypermotility which is possibly due, or even probably due, to the hyperacidity. After the fluoroscopic examination plates were taken immediately and also at intervals of fifteen minutes and five hours. The first plate, taken immediately after the fluoroscopic examination, showed a very much elongated stomach with a large gas-bubble at the top. The stomach extends almost vertically on the left side of the body from the diaphragm to the left iliac fossa. The pyloric area is somewhat contracted. There is no distinct duodenal cap, though the plate clearly shows the bismuth passing into the duodenum. The second plate shows a very marked contraction in the region of the pylorus. It will be noticed that a thin stream of bismuth is issuing from the antrum pylorici and passing into the duodenum, and that this stream is interrupted by a little patch of bismuth, which shows white in the plate, and which probably indicates the presence of an ulcer lying in the duodenum behind the pylorus. The third plate shows a rather marked five-hour retention. During five hours the barium has passed through the small intestine into the large and transverse colon, but there is still a well-marked amount remaining in the stomach at the end of five hours. This indicates a considerable delay in emptying of the stomach. This delay may be functional or organic. In view of the presence of an ulcer apparently filled with bismuth and in view of the lack of the duodenal cap, an ulcer of the duodenum may well be present.

On the other hand, the history of the case is very clearly an ulcer of the stomach. We base this latter conclusion upon the fact, first, that there is a loss of weight much greater than usually occurs in ordinary duodenal ulcer; second, that the pain is epigastric, that it appears fifteen minutes to a half-hour after meals, and that it is made worse by the ingestion of food. Furthermore, it is a burning, heavy feeling, constant, and not wave-like or rhythmic, thus ruling out pylorospasm. Associated with this pain there is also tenderness located in the epigastrium, where we should expect it to be in ulcer of the stomach. We also base the diagnosis of ulcer of the stomach upon the presence of regurgitation of food and nausea, these symptoms not being present in ulcer of the duodenum unless the ulcer of the duodenum is also associated simultaneously with ulcer of the stomach. On the other hand, we are not prepared to say that the patient has no ulcer of the duodenum. Our reason for this statement is that the *x*-ray plate, with its absence of duodenal cap and apparent localization of a patch of bismuth in the duodenum, speaks strongly for duodenal ulcer.

As I said before, if an ulcer of the duodenum develops when an ulcer of the stomach is already present there is no means of deciding just when this duodenal ulcer actually first developed. If, however, a man has a duodenal ulcer, and then develops a gastric ulcer, it is quite easy to say when the gastric ulcer first appeared. In this case we will have to make a diagnosis of ulcer of the stomach, with suspicion directed toward the duodenum by reason of the *x*-ray plates alone, and not by reason of any symptomatology. We also are of the opinion that the plate showing a retention of barium at the end of five hours indicates a blockade, only partially to be sure, at the pylorus.

What shall be done in such a case in the way of treatment? This patient has been treated for a long period in a way which ought to have cured an ordinary ulcer. He, however, has been in nowise improved. On the contrary, he is continually losing weight, even up to the present time, and the pain is as bad as ever. Will gastrojejunostomy help him? Yes, provided the gastric ulcer lies close to the pylorus on either the gastric or duodenal side. We have no reason for believing that his ulcer is in the fundus or on the greater curvature, or anywhere than very close to the pylorus, and well within the antrum pylorici. If we believed that the ulcer was located on the greater curvature or on the lesser curvature or in the fundus, we certainly would not advise operation. It is because we believe the ulcer lies quite close to the pylorus that we think an operation should be done.

What will the operation accomplish? It will give the ulcer a chance to heal while food is passing the new way from the stomach into the jejunum. An ulcer located at or near the pylorus, either on the gastric or duodenal side, is constantly irritated by the excessive acid in the stomach and is kept in a continuous state of activity. If it can be spared this continuous irritation it has a marked tendency to heal. Medical and dietetic treatment in this patient has been of little avail in Texas and at his home. We have not advised that it be carried out here. On the contrary, we have referred him to the surgical department for operation.

Dr. E. Wyllys Andrews (operating): I have studied the plates shown by Dr. Mix, and I agree with his conclusions and add one other. I am sure I see the ulcer hole packed with bismuth in two of the skiagrams. It is in the upper duodenum.

We believe these cases are surgical only after they have had a thorough working out medically. As we raise the stomach you notice the pyloric ring and the anatomic distribution of the pyloric vessels. There is a point 4 cm. below that ring at which there is a hard, scirrhous cicatrix (Fig. 1, 1). It is 1 x 1½ cm. in size and not at the pylorus, so that the symptoms of obstruction must have been due to reflex spasm of the pyloric sphincter brought about by the irritation of that ulcer floor when the acid gastric juice flowed over it. Further exploration reveals that the pancreas is normal in position and consistency. The gall-bladder is somewhat large and soft and, on pressure, slowly empties itself. There are no gall-stones to be felt in the gall-bladder or bile-ducts. The liver edge is sharp and in normal position.

This case belongs to that type of ulcer of the first portion of the duodenum which is often hopeless without surgery. I see dozens of cases which have not been benefited by medical treatment, or only temporarily cured. We advise this operation for the purpose of short-circuiting the contents of the stomach into the jejunum. I will raise the colon and lift it forward in order to reach the jejunum properly below. I can reach the jejunum

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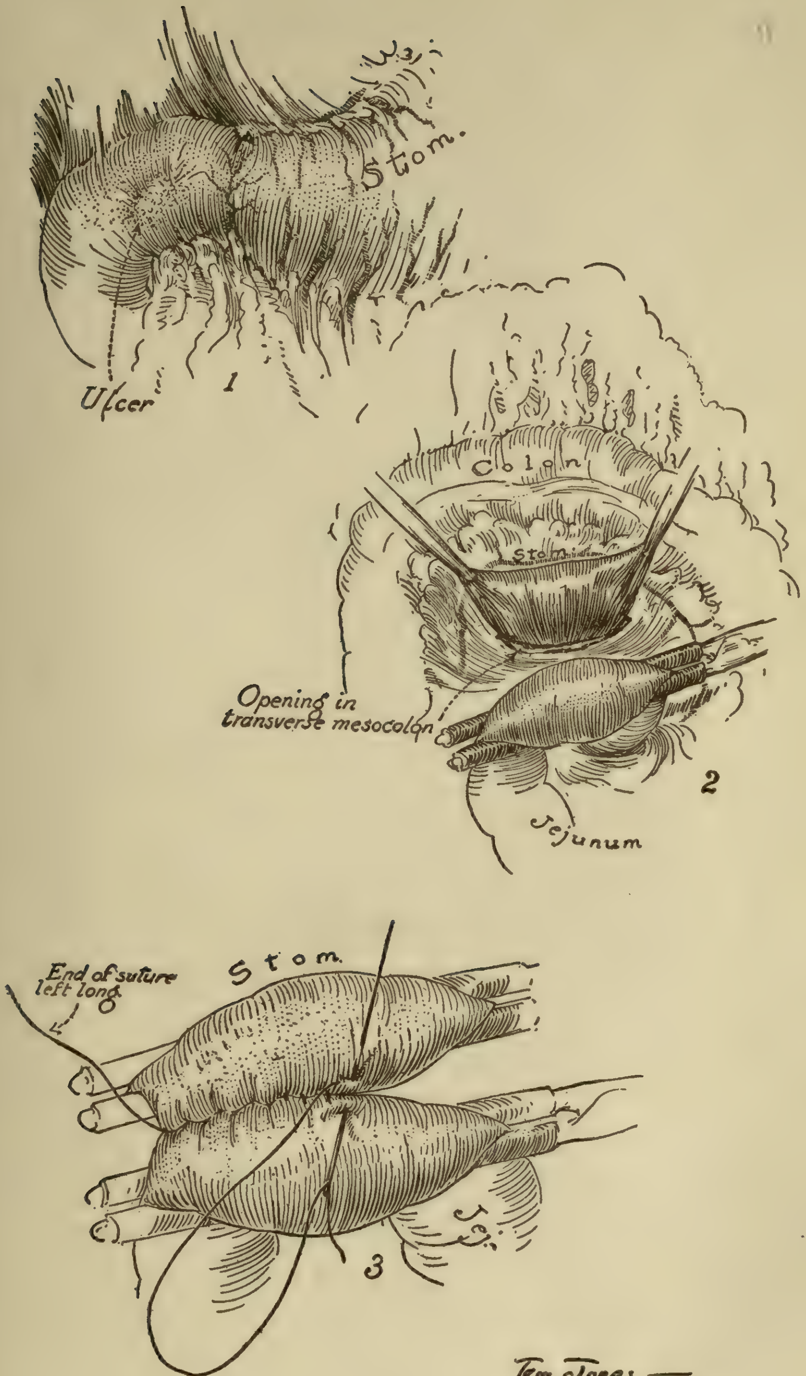
Fig. 1.—The three-stitch method: 1. Contracted pylorus and scar of duodenal ulcer. 2. Opening in mesocolon. Wall of stomach drawn through ready for clamp. Jejunum has been clamped. Note jejunal fossa and "no loop." 3. Both clamps in position. Insertion of seroserous or first of three suture lines.



Tom Jones —

Fig. 1.

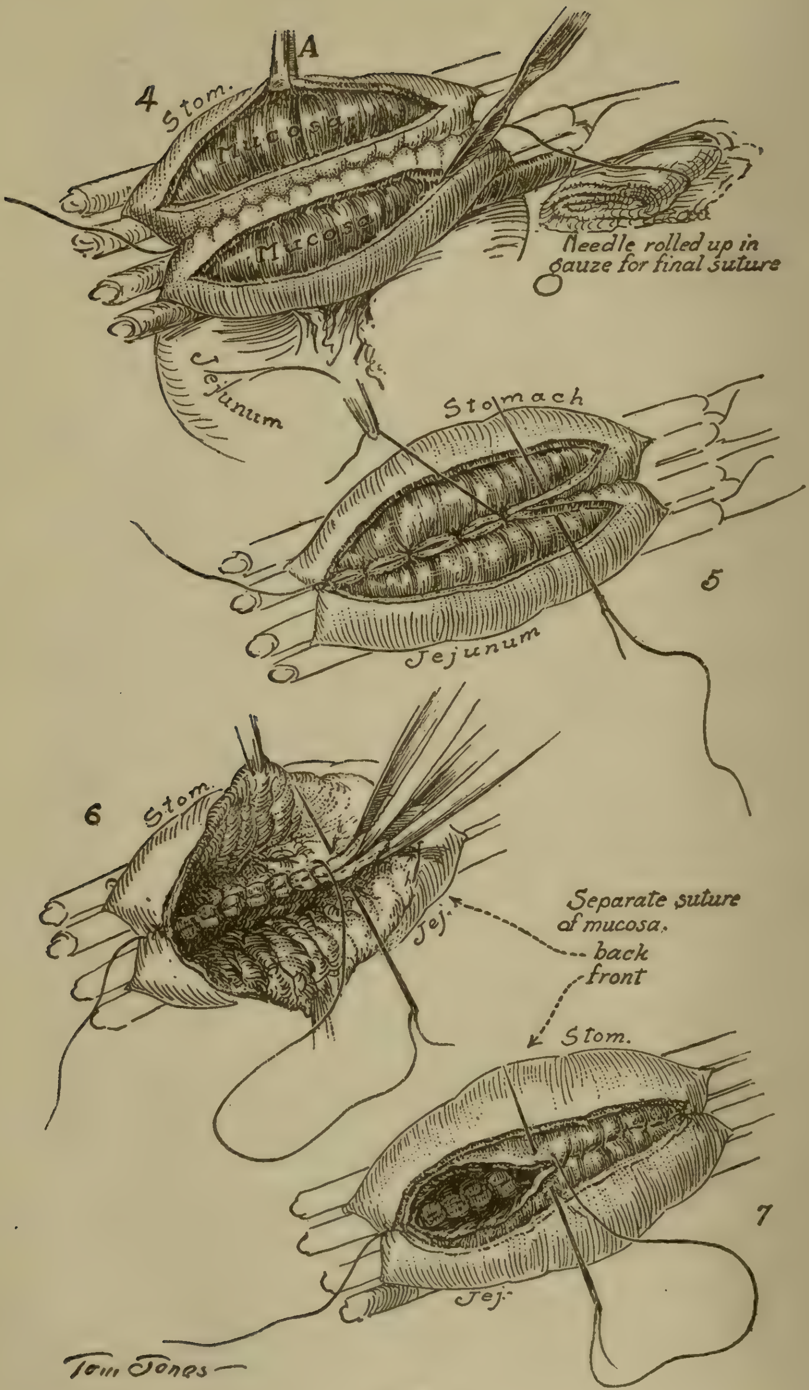

A
4
Stom.
Mucosa
Mucosa
Needle rolled up in gauze for final suture
Jejunum
Stomach
5
Jejunum
6
Stom.
Jej.
Separate suture of mucosa.
back
front
Stom.
7
Jej.
Tom Jones

Fig. 2.

guided by the sense of touch, running my finger along until I feel the ligament of Treitz. I draw this loop of jejunum up with my finger. We will make a short loop here, sometimes called a "no-loop," that is, we draw the jejunum out until there are no bowel loops intervening between the duodenojejunal junction and the point which we select for anastomosis. It is very important in this anastomosis to reach a part of the posterior wall of the stomach near the pyloric end. In order to do this, I open through the transverse mesocolon by blunt dissection. We just tear it until the stomach wall appears. Now we try to get that part of the stomach wall which is near the pylorus (Fig. 1, 2). I do not quite like the first place at which I penetrate the mesocolon because of these adhesions. We will go farther toward the smaller end of the stomach. Now you see we are close to the pylorus—just how near we determine when we rotate the colon downward and look above it.

This operation will consist of an anastomosis made with three separate rows of sutures. First row: We put in a continuous Lembert stitch joining the stomach and bowel behind (Fig. 1, 3). Second row: With a sharp knife we incise the serosa and muscularis for a distance of about 2½ inches on the stomach parallel to and about 1 cm. from the row of Lembert sutures, and then duplicate this incision on the jejunal side. We then make a couple of flaps on each side by pulling the edges of the incision through the peritoneum and muscularis gently apart (Fig. 2, 4), so that we may make a sort of edge-to-edge union of the contiguous gastric and jejunal flaps—our second row of sutures. These are interrupted silk sutures. The placing of interrupted sutures is somewhat more time consuming than is the case with a running suture, but the result is very satisfactory (Fig. 2, 5). I have never had one of these leak. This is practically a return to the original Billroth three-layer stitch. It is the only method I have

Fig. 2.—4 and 5. Formation of the seromuscular flaps and placing the second row of sutures. Line steadied by using last stitch as guy-rope. Note Lembert suture wrapped in gauze and laid aside until needed to complete the first row of sutures. 6 and 7. Stitch three. Mucosa opened and united by running stitch behind and in front.

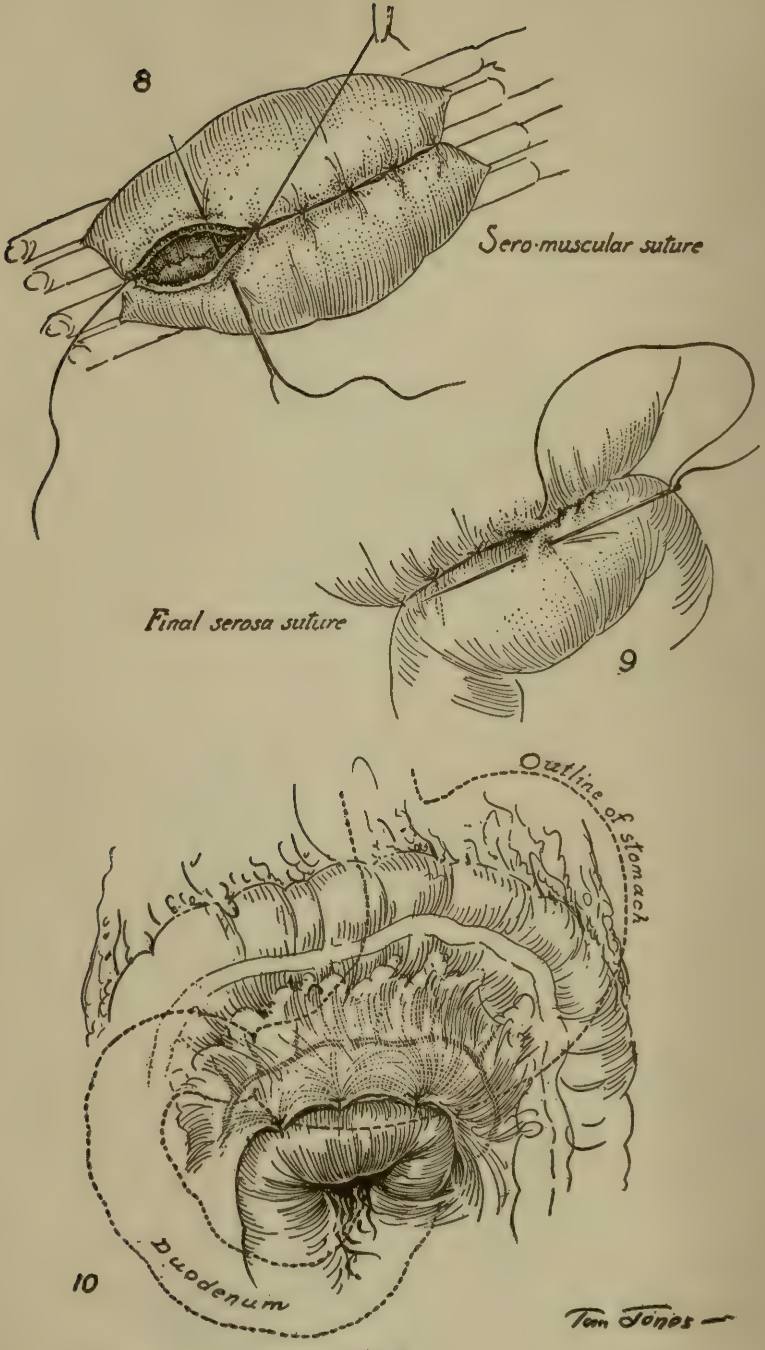

8
Sero·muscular suture
Final serosa suture
9
Outline of stomach
Duodenum
10
Tom Jones

Fig. 3.

ever used in which I have had no leak. It takes much longer than other methods, but it is more satisfactory in the end. Third row: Here is the mucous membrane, which we now lay open. We have already approximated the serosa. This is the mucosa stitch. We put in three stitches and then take a back stitch to prevent puckering. If there is no puckering of the suture line there will be no contraction of the new stoma. This stitch will have to go all around the bowel. Now I have a complete circle of the mucosa (Fig. 2, 6 and 7). We start with our interrupted stitch again; that is, we complete the second row of sutures, uniting the two remaining flaps of peritoneum and muscularis (Fig. 3, 8). I think there is some value in having part of the cut surface left at this point, as is done by these interrupted sutures, rather than an inverted peritoneum, as is the case when a continuous stitch is used. Now I take off the intestinal clamps. This needle was on one end of our first serous stitch, that is, the Lembert which constituted our first row of sutures. We continue it over the anterior aspect of our anastomosis as a modification of the Lembert. We lock this at each third stitch, so that it will not pucker. It is a seroserous right-angle stitch (Fig. 3, 9).

Here is our stomach. Here is the hole in the mesocolon. We want to fasten the margin of that opening in the mesocolon to the stomach. This is done carefully so that there cannot be any possibility of a hernia. Here is the finished anastomosis (Fig. 3, 10).

We do not think we have finished these operations unless we occlude the pylorus. There are several ways in which that may be done. I shall be content with simple ligation. I do not expect that will ever want to be opened, but it can be. Brewer, of New York, inserts aluminum rings. The method which I show you happens to be a very conservative and safe one (Fig. 4, 1–4). Another very good method of producing occlusion is to divide the serosa and muscularis, stretch them apart and sew up the mucosa,

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Fig. 3.—8. Serous and muscular cut edges united by interrupted stitches in front of stoma (completion of second row of sutures). 10. Site of anastomosis secured to opening through mesocolon. (Note close proximity to ligament of Treitz and absence of jejunal loop.)

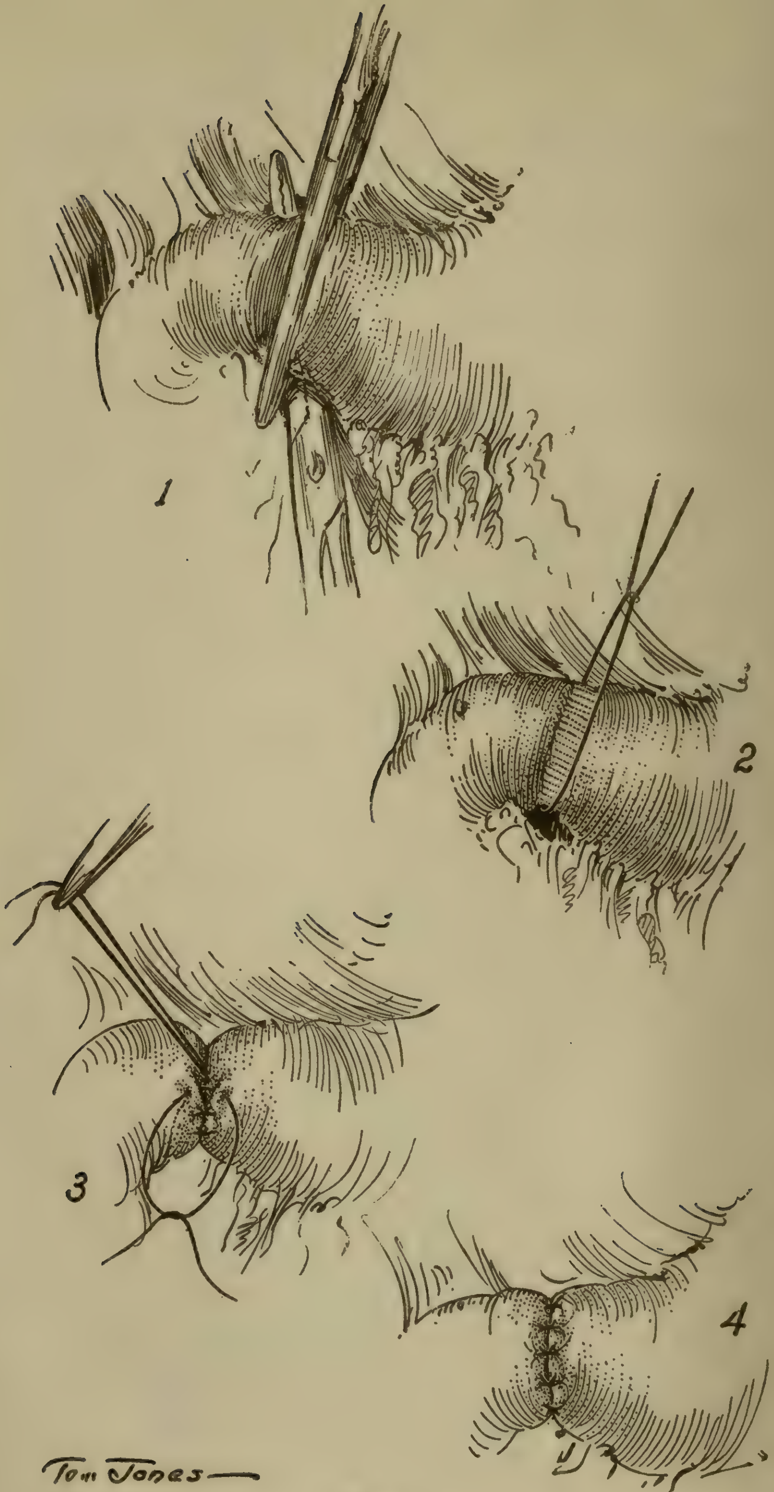


Fig. 4.

afterward reuniting the outer walls. Last summer we cut down on a pylorus and removed it because it was the size of a hen's egg, hard and tumor-like, and we thought the patient had carcinoma. Much to our surprise, the microscopic report was not carcinoma but chronic ulcer. We believe, in certain cases, in removing the pyloric ring and pieces of the stomach—what Rodman called the removal of the ulcer-bearing area—in simple ulcer. At any rate, we insist that every case of duodenal ulcer, or ulcer even of the stomach or pylorus, must have an occlusion operation.

Here is what we were up against in some of these cases before we practised pyloric exclusion. In the first place, a certain amount of the sudden relief we get from gastro-enterostomy is due partly to the regurgitation of bile and pancreatic fluid, as proved by Patterson. At any rate, drainage causes marked and sudden relief and great improvement. The result of that improvement is that the duodenum or even the stomach wall is relieved of irritation, and slowly, during the first few months or year, the ulcer heals. The ulcer heals and the stoma functionates for a while, but eventually the pylorus opens up again, and then, curiously enough, the stoma decreases much in size or may even close entirely. Why the false opening will close is very hard to say. It does, however, in many cases, although those are the cases in which there is not already an organic obstruction. With the reestablishment of the pre-operative anatomic conditions, however, the ulcer area is subjected to renewed irritation which not infrequently leads to the return of symptoms. When the pylorus is occluded, however, the artificial stoma does not close and the ulcer area is permanently protected from the old irritation.

Fig. 4.—Details of pyloric occlusion: 1. Crushing with Péan heavy-jawed forceps. 2. Ligation of crushed layers. 3. Inversion by row of stitches. 4. Inversion suture complete.

CLINIC OF DR. A. J. OCHSNER

AUGUSTANA HOSPITAL

BASAL-CELLED EPITHELIOMA OF NECK; EXCISION WITH CAUTERY

Summary: Patient, aged seventy years, presenting ulcerating tumor of the skin in the region of the mastoid process and the angle of the jaw; removal by cautery; the cautery minimizes local recurrence after operation by preventing implantation of tumor cells; dangers of removal of sections before operation for diagnostic purposes; necessity of clean, thorough dissections.

History.—The patient, a married woman of seventy years, was admitted to the hospital September 24, 1917, because of a growth under the left ear.

Her family, past, and menstrual histories are negative. She was married at seventeen and has had 10 children, 5 of whom are living.

For the past six months there has been a lump growing under the left ear. It appeared as a pimple on the skin and gradually increased in size. There has been no pain connected with it, and for the past two months it has been discharging a small amount of serum.

Physical Examination.—The patient is a well-developed and moderately obese elderly woman with a good color and no evidence of cachexia. All the teeth are missing. On the neck, midway between the angle of the lower jaw and the mastoid process, is a rather hard solid mass the size of a hen's egg, which is somewhat spindle shaped and whose two poles are in the axis of the sternocleidomastoid muscle. The overlying skin is attached to it. There is but slight attachment of the tumor to the deeper structures. Just above the middle of the tumor there is an ulceration 1.5 cm. in diameter, extending through the skin and discharging a thin yellowish fluid. There are no other lymph-glands palpable anywhere else in the neighborhood.

The lungs and breast are negative. The heart-rate is 84 per minute. There is a strong systolic and a soft diastolic blow heard best at the apex and transmitted to the base and the great vessels of the neck. There is a skip of systole of the ventricle every five to ten beats. The heart is somewhat enlarged to the left. The abdomen is negative.

Comments and Operation.—Dr. Ochsner (September 25, 1916): This patient has been anesthetized with ether, and, as I am to remove this growth with the cautery, we will cover the face with a wet cloth.

You observe a swelling here 5 cm. in diameter extending from the lobe of the ear downward. In order to prevent local implantation and transmission of this carcinoma I am performing this operation entirely with the electric cautery. I believe that I will be able to remove this entire growth and that our patient will be free from the possibility of recurrence. You see I am making my incision (Fig. 5, 1) fully 2 cm. away from the edge of the growth. I am right up against the facial vein here. Now I am going to disinfect my hands and dissect down with the knife, because there cannot possibly be an infection of the skin below this point (Fig. 5, 1). I make my incision right through the skin with the cautery and make this incision with the knife.

It may seem useless to go to all this trouble, but I see a gentleman every month or two who had a recurrent carcinoma in exactly this same position, which had been removed with the knife twice before he came under my care twelve years ago. Then I made this operation and the man is perfectly well. I have another case from whom I obtained a report just a few days ago on whom I performed this same operation for melanotic sarcoma that had been removed twice. Once it had been removed by the greatest surgeon in the country in his particular field. Then it recurred, and was operated by one of the professors here in Chicago, and then came back. Professor Senn was the previous surgeon. Then, while he was on his vacation, the patient came back, and it did not seem as though it would be wise to wait until Professor's Senn's return from Europe, so I undertook the removal. That was in 1892. In 1904, twelve years later, I

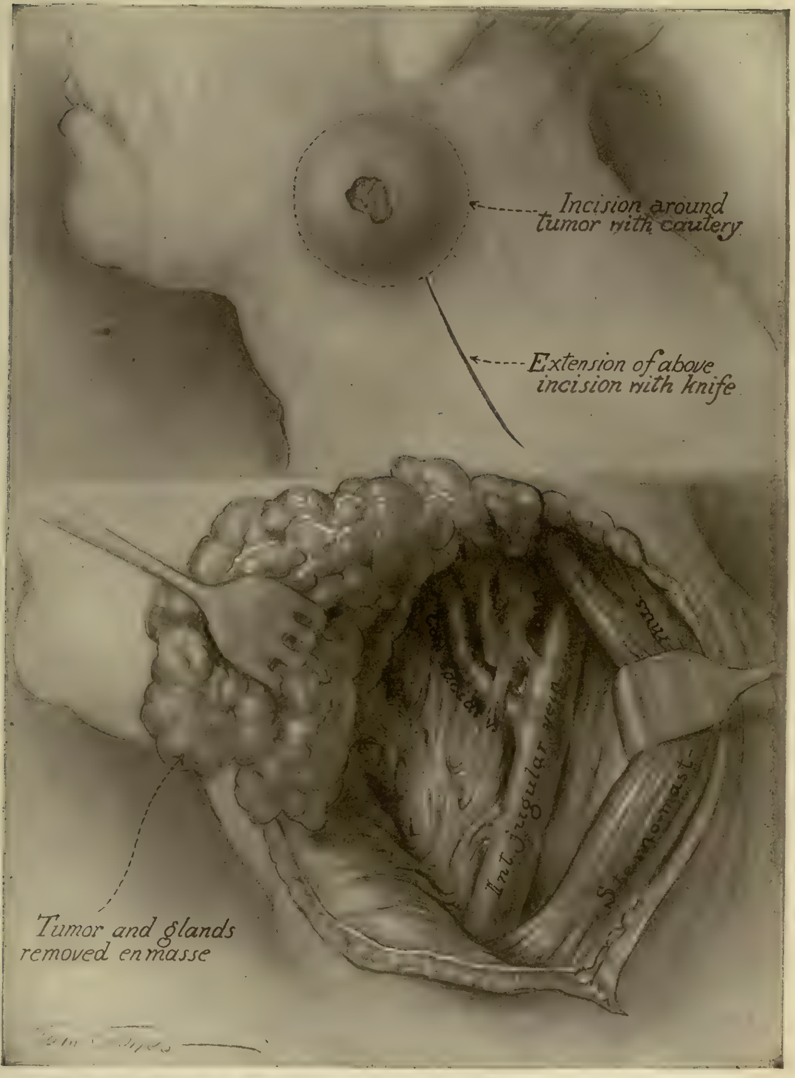

Incision around tumor with cautery
Extension of above incision with knife
mus
Int. jugular vein
Sterno-mast.
Tumor and glands removed en masse

Fig. 5.—Excision of epithelioma of the neck by cautery. Above (Fig. 1), lines of incision and appearance of tumor. Below (Fig. 2), the tumor with the underlying deep fascia and lymphatics being removed from below upward. Note clean dissection of the veins.

visited the city in Iowa from which the patient had come, and in some way she learned that I was at the hotel and called upon me. She was perfectly well. That was twelve years after the last operation. That is a case that without this operation would undoubtedly have been lost, and therefore I believe it is perfectly proper for us to perform the same operation on this patient.

Here, you see, I have exposed the deep jugular vein from the mastoid process to the clavicle. I am removing all the fat and all the lymph-nodes so as to leave the jugular vein entirely stripped of fat and fascia. I am very careful not to tear the little branches of the jugular vein out of their insertions in the vein. You see we are getting this mass of fat and lymph-glands free from the jugular vein. Now you see how perfectly we have laid bare the entire field (Fig. 5, 2).

For one week before the operation this patient has received intensive x-ray treatments. We will give her six more intensive x-ray treatments, beginning the first today. The glands attached to the deep jugular vein just below the parotid gland are now removed. Now, if not ready to make such an extremely extensive operation in a case of this kind one must never touch these cases, because one is apt to stir up the cancer cells and make them grow faster, and thus do the patient a great deal of harm. You can see the jugular vein moving, filling and emptying with each respiration. You see the facial vein here. We almost always find a gland at that point, just between the facial vein and the jugular vein. We must always look for this gland. Here I am right up against the cricoid cartilage, so that I have removed every particle of suspicious tissue.

We never remove portions of any growth previous to operation for diagnostic purposes because it is of no interest at all to the patient what the microscopic diagnosis is, but it is of great interest not to have it transmitted. I have found in many cases in which pieces of growth were removed for diagnostic purposes that the patient was in a hopeless condition within a few months afterward because metastases had occurred, which I believe were due to the opening up of the space during the removal of the piece for preliminary microscopic examination.

I am going to remove the submaxillary salivary gland because of its proximity to the edge of our tumor. We will make a separate microscopic section of the duct of the salivary gland so as to make sure that there was no infection.

When you elevate the head, as we have here in this patient, the anesthetic remains active for a considerable time, so we can finish the use of the cautery entirely before it will be necessary to give her any further anesthetic.

A number of surgeons have suggested the use of boiling water in these wounds for the purpose of sterilization against the malignant cells which might still be present. Of course, having removed it carefully by means of the cautery, this is not so important.

We will now close the wound with horsehair after applying this small strip of iodoform gauze in the lower corner to allow serum to escape during the first twenty-four hours.

On account of her age (seventy years) she will be given a head-rest at once, and tomorrow will be allowed to sit up in a chair. It is necessary that aged persons be not made to lie flat after anesthesia because of the great liability to pneumonia or pulmonary edema.

NOTE.—Microscopic sections of the tumor removed proved the tumor to be a basal-celled epithelioma. The patient received the *x*-ray treatments as outlined and left the hospital on the fourteenth day after operation.

REPAIR OF POSTOPERATIVE VENTRAL HERNIA

Summary: Causes of postoperative hernia; indications for operation; obesity a serious complication—its management; methods of repair—technic in present case; after-treatment.

History.—The patient is a married woman aged forty-two, who entered the hospital October 16, 1917. Her mother is living, but has two herniæ and spinal trouble. Her father died of Bright's disease at the age of sixty-five. She has 5 brothers and 5 sisters living and well. Two aunts died of cancer. There is no tuberculosis in her family.

The patient states that she has had a large swelling in the groin for about five years. This came on within a few months after an operation for appendicitis. She complains of a general soreness throughout her abdomen when she is on her feet or does heavy work. The swelling disappears when she lies down. She has had a dull aching pain in the left side of the chest off and on for four years, which has been somewhat worse during the last two weeks. She has urinated three and four times a night since the appendix operation. She had one miscarriage thirteen years ago.

Menstrual.—Began at twelve, regular, twenty-eight-day type, painful on first day. Last period October 1, 1917.

Appetite is good, sleeps well; has been moderately constipated during the last three months.

Past History.—Had scarlet fever, diphtheria, and measles when a child; no other illnesses except chronic appendicitis. Had a tonsillectomy fourteen years ago; a turbinectomy five weeks ago.

Physical Examination.—The patient is a well-developed, somewhat obese adult with a ruddy color. Scleræ are clear. Pupils are equal and respond to light and accommodation. Nose and ears are negative. Tongue is clean. Tonsils have been removed. Teeth in fair state of repair, although several molars are missing. Neck is negative.

Chest.—Heart and lungs are negative.

Abdomen.—There is a broad puckered scar at the site of the McBurney incision. A bulging mass, the size of a grape-fruit, protrudes from the right lower quadrant when the patient stands or sits, but disappears when she lies down, although the right lower quadrant remains more prominent than the rest of the abdomen. Defects in abdominal wall can be felt below and on each side of the scar. Moderate tenderness is present all over right lower quadrant; no rigidity.

Vagina.—Perineum intact; cervix small; uterus of moderate size; good position. An indefinite mass, apparently the size of a large orange, is felt in the right iliac fossa, and this is continuous with the uterus.

Rectum.—Three small external hemorrhoids are present.

This patient has a ventral hernia 15 cm. in diameter, resulting from an operation for the relief of suppurative peritonitis following acute appendicitis with perforation. The operation, which was performed five years ago, required free drainage through the abdominal wall. Such herniæ are of very common occurrence in cases in which the condition found at the time of the operation necessitates free abdominal drainage. Occasionally it is possible to unite the abdominal wall after the suppuration has subsided by means of silkworm-gut sutures, but ordinarily the deep suppuration persists so long that secondary closure of the abdominal wound does not succeed in preventing the formation of a ventral hernia.

Following operations for aseptic intra-abdominal conditions, in which the abdominal wall can be closed without the use of drainage, herniæ almost never occur at the present time because the different layers of the abdominal wall are carefully approximated, so that the abdominal wall is at least as strong at the point at which the operation was performed as it is at any other point.

Indications for Operation.—In cases in which the hernia gives rise to distress or disables the patient from performing such labor as he desires; if there is a tendency to strangulation of the protruding intra-abdominal structures; if the covering of the hernia is so thin that there is danger of rupture; if the coexisting adhesions threaten to cause disturbances of the digestive apparatus; if there has been a tendency to strangulation of the intestines because of these adhesions; of if the appendix has been left in place at the time of the primary operation, it is well to relieve the condition by means of an operation.

In many of these patients the presence of extreme obesity seems to be a contraindication to operation, but by careful and persistent dieting it is practically always possible to reduce the amount of fat present in the abdominal wall to a marked extent in a relatively short time. The important feature in preoperative dieting seems to lie in the selection of a varied diet so that the patient receives a sufficient number of calories each day to maintain a healthy condition, but the food supplying these calories should be of a character not to produce more fat, so that the patient may consume her own fat while she is augmenting her physical strength.

We have a carefully worked out diet consisting of three breakfasts, three luncheons, and three suppers. Of each group the patient may choose each day one for her breakfast, one for her luncheon, and one for her supper. Aside from this, she is permitted to add an orange or half a grape-fruit to any meal if she chooses. In this way we have reduced the weight of patients before operating from 20 to 100 pounds without interfering with their strength.

Unfortunately, many of these patients are not able to walk because of the hernia. Those that are able to walk will, of course, reduce the amount of fat in the abdominal wall more rapidly. Hot baths and massage are also applied, and the amount of water consumed is carefully limited. A little lemon-juice is added to the water which the patient drinks between meals.

Reducing the amount of fat in the abdominal wall not only facilitates the operation greatly, but it also places the tissues in the abdominal wall in a much better condition for obtaining solid union.

Preparation for Operation.—These cases differ in no way from the usual operation for patients upon whom an abdominal section is to be made, but special care must be taken not to give the patient any nourishment for one or two days previous to the operation, which might have a tendency to produce quantities of gas. Moreover, the alimentary canal should be thoroughly emptied by means of castor oil and soap-suds enemas. On the day previous to the operation nothing but broth and an abundance of water are given by mouth.

Kinds of Operations.—Whenever it is possible to expose all of the layers of the abdominal wall so that each layer can be distinguished on both sides of the incision, we choose this as the first step of the operation. This can be done most easily when the ventral hernia appears in the median line, or when during the primary operation the rectus muscle has been split longitudinally.

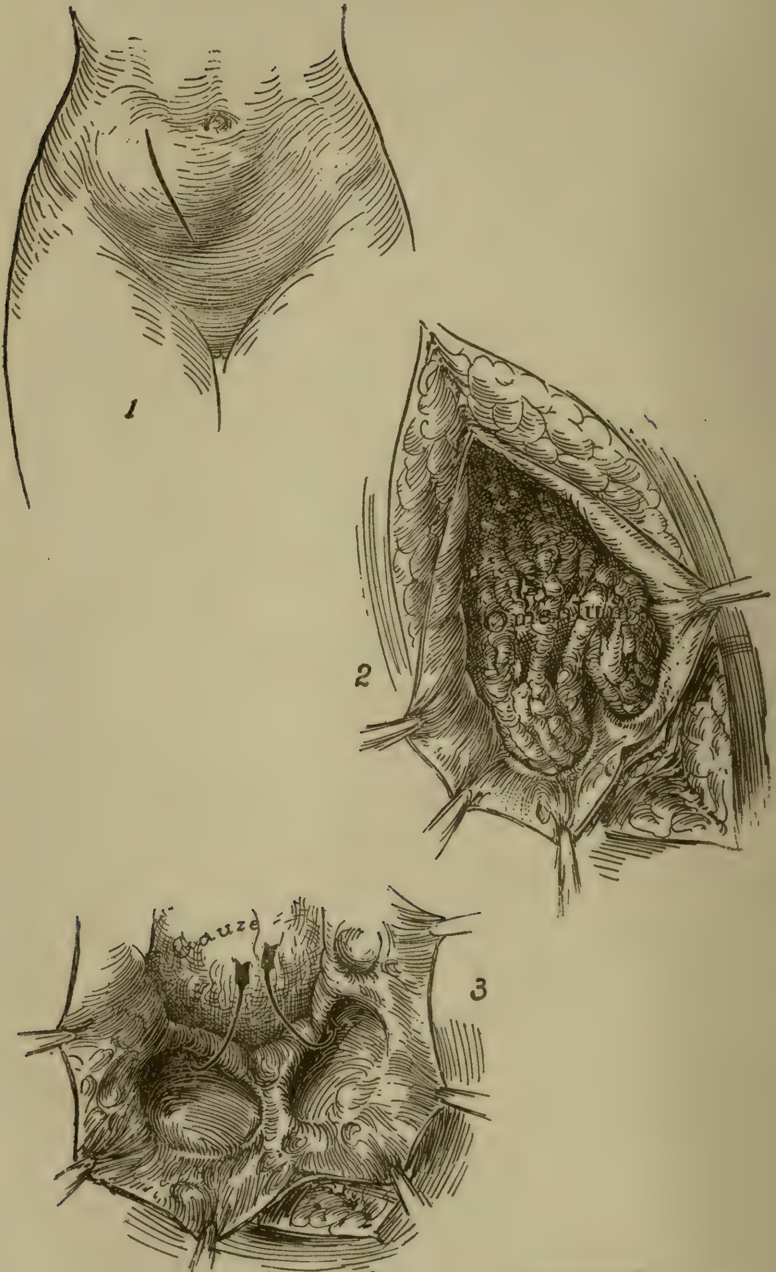
Having exposed all of these layers, silkworm-gut sutures are passed down through all of the layers to the peritoneum, but not through it. These sutures are placed about 2 cm. apart and are left untied for the present. Then the peritoneum and transversalis fascia are sutured separately by means of fine catgut sutures. The muscular layer is next sutured in the same manner, and then the aponeurosis is sutured with chromicized catgut. Lastly the skin is sutured with horsehair, and then the silkworm-gut sutures are tied over all to serve the function of safety sutures. For a time we omitted these deep silkworm-gut sutures, and it happened that several patients tore open the abdominal wounds and forced out the intestines upon the surface of the abdomen. This injury occurred as the result of retching or coughing, sneezing or vomiting. Fortunately, none of these patients died as a result of this accident, but we have returned to the former plan of placing the silkworm-gut safety sutures that has just been described.

In this case the hernia has existed for a period of five years, and it does not seem likely that it would be possible to dissect out all of the different layers in a manner which would enable us to suture each layer in its proper place. Consequently, we will employ a method which we have found most useful in similar cases.

Technic.—We first excise the scar-tissue in the skin. The only tissues holding the intestines in place in this case are the skin, a thin layer of fascia, and the peritoneum, so that the entire thickness is less than 1 mm. We are careful to begin this incision as far up as possible in order not to risk injuring any loop of intestine which might have become adherent. The index-finger of the left hand is then introduced through this opening, the adherent omentum is pushed to one side, and the abdominal wall is then opened the entire length of the hernial sac. The intestines and the omentum show a tendency to protrude through this opening, so we will elevate the foot of the table so as to place it at an angle of 45 degrees. This will permit the intra-abdominal contents to slide up underneath the diaphragm which will facilitate the succeeding steps of the operation greatly.

At each end of this wound is found a pouch of peritoneum which served as a hernial sac. Each of these sacs is 7 cm. in diameter. One sac is located between the transversalis fascia and the right rectus abdominis muscle, and the other between the transversalis fascia and the internal oblique abdominis muscle, pushing the conjoined tendon outward. The bladder protrudes into the latter sac, which undoubtedly accounts for the bladder symptoms mentioned in the history. Each of these sacs is filled with omentum which is tightly packed into its cavity, and the end of one of the pieces of omentum is adherent to the rim of each of these sacs (Fig. 6, 1–3). The peritoneum containing these sacs is dissected out by grasping its edge by strong forceps and pushing against the outer wall with a piece of sterile gauze.

This having been accomplished, we have an inner and an outer layer of abdominal wall which is lined on its lower surface with peritoneum and transversalis fascia, and on its outer surface with aponeurosis of the external oblique abdominis muscle. The inner border of the wall is now exposed by placing sharp-pointed retractors about 10 cm. from its margin, and pulling these outward so as to make it possible to suture the edge of the outer margin underneath the inner margin about 10 cm. from this edge. This is accomplished, as shown in the illustration, by means of interrupted chromicized catgut sutures placed just close enough to each other to thoroughly close the suture line, to prevent any



Tom Jones

Fig. 6.

omentum or intestine from slipping through between these sutures (Fig. 7, 4). It is important to suture the ends of this margin with especial care in order not to leave a weak point in this part of the suture line. The free margin of the inner flap is now carried over the anterior surface of the outer flap, as shown in the illustration, and is held in this position by a series of carefully applied interrupted chromicized catgut sutures (Fig. 7, 5). The greatest care is again taken to adjust the ends of the margin so as to make this part of the reconstructed abdominal wall especially strong. This leaves the space formerly occupied by the hernia covered with two layers of carefully adjusted abdominal wall (Fig. 7, 6), and makes a recurrence practically impossible. The skin wound is now sutured with horsehair and an ordinary dressing is applied.

After-treatment.—At the conclusion of the operation a stomach-tube is introduced, and the stomach is carefully washed out with water at a temperature of 105° F. If this step is neglected the mucus which the patient has swallowed during the operation may decompose and give rise to gaseous distention.

The patient is given sips of hot water immediately after the operation and is permitted to chew paraffin for the purpose of stimulating the salivary glands. She is given normal salt solution by Murphy's proctoclysis continuously for two hours, with interruptions of two hours. In case of pain, morphin is given hypodermically.

On the third day the patient receives broth by mouth; on the fifth day gruel; then buttermilk. Milk is not given until the beginning of the second week, and then only in combination with milk of magnesia or lime-water in order to prevent its clotting in the stomach. Solid food is not given until the end of the second week in order to keep the intra-abdominal pressure at a minimum.

The patient is encouraged to move about in bed from the beginning and is permitted to sit up at the end of the tenth day.

Fig. 6.—Postoperative ventral hernia: 1. Line of incision through old incision. 2. The peritoneum opened, showing the omentum filling the hernial cavities. 3. Large hernial sacs that had forced their way between the transversalis and rectus muscles.

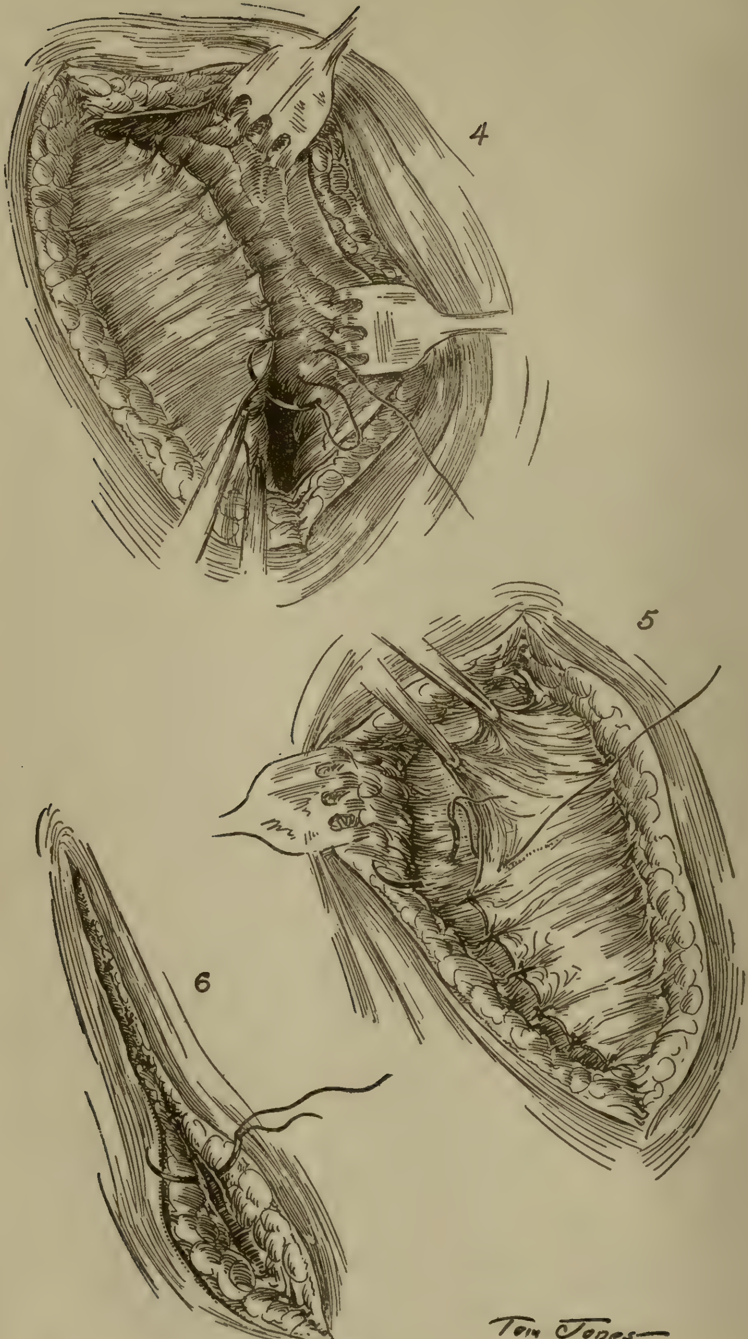


Fig. 7.

A cleansing enema is given every morning after the second day, and from the tenth day on 1 ounce of mineral oil is given every morning.

We are especially pleased with this method because of its being exceedingly simple and easily carried out, and because it leaves the weakened area of the abdominal wall splendidly reinforced.

NOTE.—In this case multiple fibroids of the uterus were also found, one of which was lodged in the right broad ligament. This condition was successfully treated by intensive *x*-rays. A clinic on the use of *x*-rays and radium in uterine fibroids will be given in a later number of the SURGICAL CLINICS.

Fig. 7.—4. The sacs have been freed and redundant tissue excised. The peritoneum on the median side of the wound is being retracted while the outer portion is sutured with interrupted stitches. 5. The imbrication being completed, thus giving a double layer of dense fascia and muscle. 6. The subcutaneous fatty structures approximated to obliterate spaces favorable to the collection of serum.

SARCOMA OF THIGH WITH METASTASES IN VASA DEFERENTIA. TECHNIC OF VASECTOMY

Summary: Recurrence of fibrosarcoma in old scar two years after primary removal with the coincident appearance of palpable nodules, pain, and tenderness in vasa deferentia; vasectomy—the small incision over spine of pubis; sociologic value of vasectomy.

The patient, a married man of thirty-four years, was admitted to the hospital for the first time March 24, 1914.

His family and past histories were negative.

At that time he complained of a large mass on the left leg which had been present for three years. The mass had gradually increased in size until at the time of examination it was about the size of a child's head. There was no pain except when lying upon the mass. It had always been more or less hard. There was no discoloration of the skin overlying the mass and the skin could be moved about freely over it. It caused no inconvenience other than pain on long-continued pressure.

The examination of the patient was negative except for defective vision in both eyes and a tumor of the lower third of the outer surface of the left femur. The circumference of the leg at the largest portion was 26½ inches. The tumor mass was hard, did not fluctuate, and was apparently connected with the bone (Fig. 8, 1).

The patient was operated upon March 25, 1914. A lateral incision was made extending from the outer condyle of the femur to the spina iliaca anterior superior. The skin was carefully dissected off the tumor and then the tumor and a portion of the muscle on the outer surface of the leg were removed *in toto*. The incision was closed with horsehair without drainage.

Microscopic examination of the tumor showed it to be a spindle-cell fibrosarcoma.

The patient returns to the hospital now because the tumor which was removed in March, 1914, is recurring in the same position. There is no pain nor ulceration.

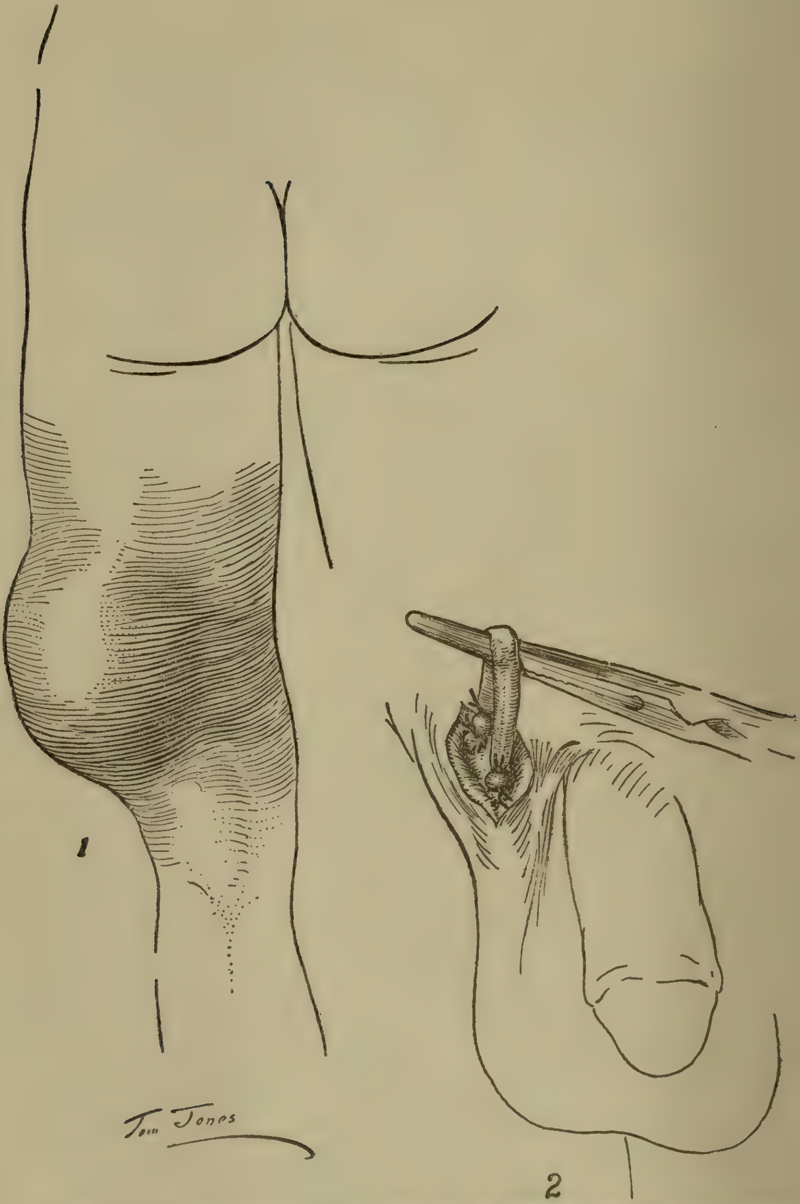


Fig. 8.—1. Appearance of tumor before the first operation. 2. Vas deferens doubly ligated at each end preparatory to its removal. Note small incision over external abdominal ring through which the operation is performed.

For the past two years he has been having pain in the testicles, which has recently been getting worse. The pain comes on when he sits down. If he stands up it goes away. There is no pain or burning on urination and no sudden stoppage of the stream. Sometimes the testicles swell up at the same time he has the pain. There is no hernia and he denies venereal infection.

Examination shows that his eyes have multiple corneal opacities. He is having an iridectomy done on both for visual purposes. The tonsils are submerged, tongue is coated, teeth in fair condition, and breath is foul. The chest, heart, and lungs are negative. There is a nodule the size of a walnut just above and to the outer side of the knee. It is situated immediately below the site of the previous incision and is movable. The scar is long and broad.

Rectal examination is negative. The vasa deferentia are distinctly palpable, contain many hard nodules, are quite tender, and appear to be the site of constant, annoying pain.

He was operated on November 15, 1916. The tumor mass was excised from the lateral surface of the knee. It was the size of a small plum, sharply demarcated, hard, and fibrous. There were a few small nodules of a similar substance in the surrounding tissues. These nodules averaged 0.5 cm. in diameter and were sharply defined. They also were removed.

On December 8, 1916, a cystoscopic examination was made. A catheter was passed with ease. Tenderness was elicited on passing through the prostatic urethra. The bladder presented a marked grayish, corrugated appearance, indicative of a low-grade inflammatory condition. The ureteral openings were not seen, due to the ragged appearance of the bladder wall. No hyperemia, stones, or masses were present.

Operation.—DR. OCHSNER (December 18, 1916): The region of the sarcoma has been treated with *x*-ray since the operation and he has no signs of a recurrence. The growth itself did not seem very malignant. It was a spindle-cell fibrosarcoma, which did not seem to show a great tendency to malignancy, and it is quite possible that the patient will be permanently well. The thing he complains greatly of now is pain in his vasa deferentia.

This pain has persisted for some time, and it has seemed that his request for the removal of the vasa deferentia was reasonable because it is likely that he will get relief from the pain. I have not made out a definite cause for the pain, although, as you see here, the vas is enlarged and has nodules on it. It is quite likely that when we come to examine the vas microscopically we will find it is filled with tumor masses. The patient's mentality is such that there will be no sociologic loss in the destruction of the vasa deferentia. If these masses in the vas are sarcomatous it is certain that there are wide-spread metastases elsewhere, particularly in the lungs, and that, therefore, the operation which I am about to perform will be palliative in the very narrowest sense. However, if it will relieve this patient from pain and possibly prevent the birth of more degenerates into the world, it will be worth while.

The operation consists in a little vertical incision 3 cm. in length with its upper end opposite the external abdominal ring. The incision extends through the skin and superficial fascia and fat down to the tissues of the cord. You see the vessels of the spermatic cord. By grasping these vessels between your finger and thumb you feel a hard cord-like structure, the vas deferens. If this structure is normal it is smooth. The vas deferens is freed from the surrounding blood-vessels, carefully picking up and not compressing these blood-vessels so as not to interfere with their functional capacity. Then the vas is exposed, freed from the surrounding tissues the entire distance down to the testicle, caught in a pair of hemostatic forceps, ligated, and cut. As the next step the proximal end of the vas is stripped from its surrounding tissues right up into the abdominal cavity, so that the structure is brought up into view clear to its entrance into the seminal vesicles. Here again it is caught with forceps, ligated and cut, and the distal end is permitted to slip into the wound. The superficial fascia is brought together by means of a few fine catgut sutures and the skin is sutured over (Fig. 8, 2).

Now I hope this will relieve the patient from his pain. There will be no harm to the patient at all by this procedure. He will not be distressed in any way by it, and I believe this is a very proper operation to perform.

Many years ago, I think about eighteen or nineteen, I suggested that the operation of section and permanent occlusion of the vas be used in the treatment of habitual criminals, epileptics, and imbeciles, and since that time a number of states have passed laws for the purpose of carrying out this operation in such cases. The argument in favor of this particular operation is that the individual is not exposed to any pain, neither is there any danger to his life, while the community is protected by the limitation of the procreative powers of habitual criminals, epileptics, and imbeciles.

CLINIC OF DR. ALBERT E. HALSTEAD

ST. LUKE'S HOSPITAL

MENINGEAL CYSTS

Summary: Demonstration of patient with huge meningocele of traumatic origin; varieties of meningeal cysts—their characteristics; symptoms; treatment—transplantation of fat and fascia probably most efficient.

MENINGEAL cysts may be considered under two general heads: (1) Those that are found at autopsy, which during life have produced no symptoms. These are of obscure origin, probably the result of birth trauma or of some early infection of a mild type. The occasional presence of blood-pigment in the cyst wall or in the fluid content of the cyst indicates a traumatic origin. (2) Those cysts which are known to follow definite trauma. These develop later in life. The relation of the cyst to trauma varies in individual cases. In some, symptoms pointing to the presence of a cyst may be deferred for months or years after the injury has been sustained. This latter group are known as *traumatic meningeal cysts*. They are also known by other names—*e. g.*, hygroma of dura mater (Virchow), meningitis sursa circumscripta cystica.

When traumatic cysts follow close upon a trauma the mode of origin is easy to determine. There generally are found within the cyst cavity evidences of a recent hemorrhage. As a result of the effusion of blood the membranes have become separated (pial cysts). When the cavity has gradually been freed of the effused blood by a process of absorption of its cellular elements there remains a fluid which is identical with blood-serum, containing, as before said, either a few blood-cells or blood-pigment.

In older cysts, or those in which a considerable quiescent interval has elapsed between the injury and the formation of the cyst, the mode of origin is more difficult to explain. The presence of a low-grade inflammatory process, closing off a limited portion of the subdural or epidural space, is probably an important factor. Into these closed spaces, resulting from an inflammatory adhesion of the membranes, an exudate takes place, probably from the perivascular lymph-spaces which remain open.

In old cysts, where this inflammatory process has been active for a long time, the cyst wall becomes greatly thickened. The rigidity which results unfavorably influences the prognosis after operation.

The case I now present probably belongs to the group of traumatic cysts. The history is incomplete because of the inability of the patient to tell in logical sequence the events which lead up to what we now find.

The surgeon who operated upon him five years ago makes the statement, in a recent letter to me, that nothing was found at the time of the operation. Puncture of the lateral ventricle was performed. No satisfactory explanation of why this was done was given, nor was any information gained by this procedure.

The history of this case is as follows:

History.—*Complaint.*—Hernia cerebri over occipital region. Blindness. Deafness in left ear.

History of Onset.—About five years ago patient states he was troubled with severe headaches which were always constant. The headache was located over both temporal areas. The patient then went to a doctor who advised a decompression operation. This was done, and shortly after the operation a small swelling began to form at the point of decompression. This swelling gradually increased in size. Swelling started six months after the operation. About a month after the swelling started his eyes began to trouble him, and gradually he noticed that he was getting blind. Left eye was troubled first. Patient also states that his left ear began to throb, and also noticed that he began to hear less with left ear. Today he is deaf in this ear. If patient coughs or sneezes he must hold the hernia. If not, he has a marked pulsation in mass and feels as if it is going to break.

Past History.—Usual childhood diseases. Very severe headaches.

Venereal History.—Denied.

Family History.—Father and mother dead. Knows nothing of family. They are in Russia. Wife alive and well. No children.

Habits.—Has smoked cigarettes heavily. Alcoholic liquors freely. Bowels regular. Urination normal. Appetite good. Sleeps well.

Physical Examination.—*General.*—Patient is a well-nourished and well-built white man of forty-six years. His color is good and he has the general appearance of good health.

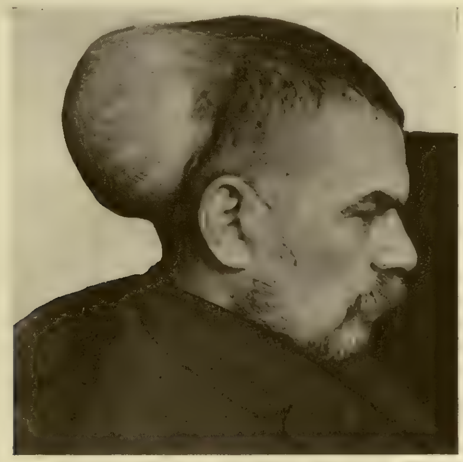


Fig. 9.—Patient before operation. Note huge tumor in occipital region, as described in text.

Head and Neck.—Coming off of the upper occipital region of the head is a tumor the size of an ordinary toy balloon half inflated. It is covered with a thin covering of short hair and shows the scar of a former incision. The tumor mass is soft, fluctuates, as if the contents were mostly liquid. The mass is about 16 inches in circumference at the junction with the surface of the head. It is painful to pressure and is painful to cold sensations (Fig. 9). He sees nothing, strong light is not even perceived. The pupils are slightly irregular and unequal.

They react sluggishly to light. Long exposure to light causes a constriction. He is totally deaf in the left ear. Hearing is good in the right. There is a marked lateral nystagmus in both eyes, the quick component being directed to the right. There is no cervical or occipital adenopathy. The throat is negative. Teeth are loose and are badly infected. The breath is foul.

Chest.—The heart tones are pure, boundaries are normal. No râles or areas of consolidation detected in the lungs. Lung excursion is normal.

Abdomen.—There are no points of tenderness in the abdomen. No scars of operations. No herniæ are present. No tympany.

Genitalia.—Negative.

Extremities.—The arms are normal. Legs are the site of numerous old scars over the lateral sides of the tibiæ. Scars are of paper thinness and are deeply pigmented. No tender areas over the tibiæ.

Lymphatics.—No adenopathy in epitrochlear, axillary, inguinal, or cervical regions.

Nervous.—Reflexes are all present and normal, except pupillary, as mentioned. Babinski sign is absent.

Examination of Eye-grounds.—Report secondary optic atrophy. (Probably secondary to an optic neuritis.) Both eyes: Vision: Has no perception of light in either eye. (Condensed light.)

Examination made by J. R. Smith, M. D., November 13, 1917.

SEROLOGIC REPORTS

Spinal fluid, November 13, 1917 (preoperative): Cells per cmm., 2.

Globulin tests:

Ross-Jones, positive.

Pandy, positive.

Wassermann: Blood, negative. Spinal fluid, negative.

Diagnosis.—Hernia cerebri. Meningocele.

This patient has been prepared for operation, and we will proceed immediately to explore, and, if possible, to correct the glaring deformity with which he is afflicted.

Operation.—The entire head was painted with full strength iodin and then washed with alcohol. An incision was made through the skin over the large tumor and the bleeding controlled by forceps. The dura was then opened, and a clear fluid allowed to flow out in small amounts at short intervals. After the fluid was all out the incision in the dura was made larger and the flaps turned over the head. A large opening in the right occipito-parietal region of the skull was found. This was 2 inches wide and about 6 inches deep (Fig. 10). This cyst cavity occupied a position between the temporosphenoidal lobe and the parietal bone. The inner (median) wall was formed by the pia covering the temporosphenoidal lobe. The outer wall was formed by the arachnoid and dura. The lining of the cyst presented a glistening white mother-of-pearl appearance. The fluid content was clear, limpid fluid. The quantity obtained was 27 ounces—about one-third of the contents of the cyst was lost. After removing by excision the extracranial portion of the cyst wall, the thin lining membrane was removed from the greater part of the intracranial cyst cavity. This cavity was then filled by a

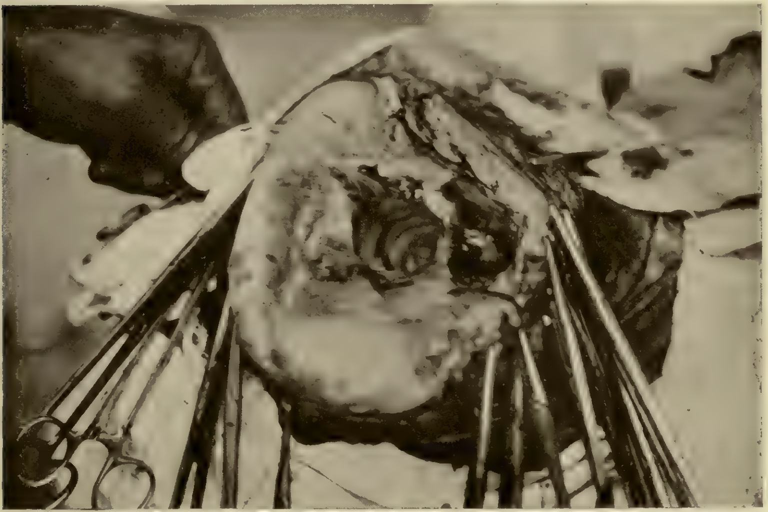


Fig. 10.—Photograph of cyst cavity exposed at operation.

transplant of fat, to which was attached a piece of fascia lata the size of the dural defect (2½ x 3 inches). The fascial transplant was united by interrupted sutures to the edges of the dura surrounding the opening into the cyst. The redundant parts of the scalp were excised. The scalp wound was closed by catgut and silkworm-gut sutures.

Meningeal cysts may be either epidural or subdural (pial cysts). Those that are congenital or develop early in life and that have produced no symptoms are mostly pial cysts.

The cyst cavity varies in size and shape. They are rarely spherical, mostly flattened or ovoid. The brain underneath the cyst wall is compressed or flattened. In *extradural cysts* the dura is depressed and is covered with a yellowish or gray pseudomembrane, which forms the cyst wall. In *intradural cysts* the dura forms the external wall of the cyst. The lining membrane varies greatly in appearance in different cases. In the one just exhibited it is glistening white, exceedingly delicate, and resembles closely the attenuated shining white membrane found lining certain epithelial cysts. In other cases it has been described as:

(1) Thick and cicatricial.

(2) Milky white.

(3) It may contain small cysts, which give a sago-like appearance to the interior of the cyst cavity.

(4) It may contain bone deposits.

Microscopic examination of the cyst wall usually shows it to be made up of parallel and concentric fibers of connective tissue with hematoidin crystals embedded within. There is usually some granulation tissue and a few fat areas. The vascularity depends upon its age. The older ones are poor in blood-vessels. Lymphatic supply in the pial or subdural cysts is limited to the perivascular connective tissue. In the cases described in which neuroglia has been found as an important element a neoplastic origin may be assumed. Beneath the cyst wall the brain is compressed, indurated, and sclerotic in some cases.

In one case autopsy some time after operation showed thrombosis of the sylvian veins, with softening of the frontoparietal lobe. In long-standing cases the brain does not expand after drainage of the cyst. The final results in the treatment depend largely on the local changes in the brain found at the time of the operation. Inability of the brain to resume its normal contour by expansion increases the chances of the cyst cavity refilling.

The character of the fluid varies greatly. It may be serous, limpid, or cloudy. Cases are described in which it was milky in character; others hemorrhagic or containing blood-pigment in varying quantities, giving it a brownish or yellow appearance. In one case it resembled olive oil. Bone splinters have been found in those occurring in compound fractures of the skull.

Symptoms.—In traumatic meningeal cysts the symptoms are those of brain tumor. As in the case now before you, headache followed by loss of vision were the only symptoms presented. Symptoms of cortical irritation may develop early or late. In one case, treated in this clinic two years ago, Jacksonian epilepsy began four years after a compound depressed fracture of the parietal bone, the result of a kick by a horse.

In general, two groups may be described in dealing with the symptomatology of meningeal cysts:

(1) Severe nervous symptoms may appear immediately or soon after the accident, convulsions, paralyses, prolonged coma, delirium, and focal symptoms, depending upon the site of injury. In the cases recorded these symptoms have developed as early as the first week or have been delayed for six months.

(2) In the second group the symptoms following the accident may be insignificant or absent. These may be only those that could be attributed to slight concussions—*e. g.*, vertigo, headache, vomiting, etc. Later, months or years afterward, serious symptoms may first become manifest. Headache, choked disk, vomiting with focal symptoms, including Jacksonian epilepsy, may develop.

The early development of focal symptoms leads to early operation, and in this way gives a more favorable prognosis than when the symptoms are delayed.

In recorded cases we find that the duration of the quiescent period has been as long as eight years.

Surgical Treatment.—The procedure that is to be employed depends largely upon the *character* of the cyst wall and the location of the cyst, particularly its relation to large blood-vessels. In epidural cysts removal of the overlying bone, excision of the dural membrane forming the inner wall of the cavity, with a fascial transplant to fill the defect left in the dura, is the ideal procedure. The cranial defect may or may not be closed. In the majority of cases, when no active inflammatory process is found, there is no probability of a hernia cerebri following. Unsightly depressions due to larger defects in the skull may be closed by bone transplant or by any of the other well-established methods of closing these defects. As a general rule the skull defects should be closed some time after the primary operation for removal of the cyst wall and closure of the dural defect.

In subdural cysts the success of the operation depends largely upon excision of a considerable part of the cyst wall and of filling the cavity with some substance that will close the cavity temporarily, allowing the brain to gradually regain its normal contour, thus permanently obliterating the cavity.

The most satisfactory method appears to be that employed in this case, viz., to fill the cavity with a transplant of fat with sufficient fascia attached to close the defect in the dura. This fat, which is obtained from the thigh, is gradually absorbed, the brain expands as this absorption progresses, and the cure is permanent.

Of the other methods which have been employed I may mention: (1) *Puncture*, which is almost always followed by refilling of the cyst; (2) *puncture and drainage*, which, if the cyst is recent, may effect a cure. In older cysts an essential feature of the operation, if a cure is to be expected, is excision of the cyst wall.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

A CASE OF CHOLEDOCHOPLASTY AND THE DEMONSTRATION OF AN OVERLOOKED COMMON DUCT STONE

Summary: A patient who was operated upon for stricture of the common duct about six months previously now returns to the clinic because of the recurrence of symptoms of obstruction.

Operation—necessity for wide exposure; reconstruction of duct—utilization of omentum and a rubber tube; cessation of the secretion of bile into bile-ducts as result of increased intrahepatic pressure.

An overlooked common duct stone recovered at the postmortem examination, which had caused two mistakes in diagnosis, two operations, and the death of the patient.

November 14, 1917.

I DESIRE to devote our clinic this morning to a discussion of one of the rarer problems and one of the most difficult problems that presents itself in connection with gall-stone disease, namely, the reconstruction of the common duct. Although this chapter in the surgery of the bile-tracts is one that has been but recently written, enough careful work has been devoted to a sufficient number of cases, operated upon by various methods, to enable us to speak with some authority about the surgical technic that has been demonstrated to be of the most value.

The patient[1] upon whom we shall operate this morning is a woman of about forty, who was operated upon a year ago by a very competent surgeon for gall-stone disease. At the time of the operation gall-stones were found in the gall-bladder, but none in either the cystic or common ducts. She had had a rather typical history of repeated attacks of gall-stone colic, never associated with jaundice or with any symptoms that pointed to any obstruction of the common duct. At the time of operation, because of the extensive disease of the gall-bladder, it was thought best to do a cholecystectomy. This was done with some difficulty on account of the adhesions, and at the close of the operation, when the surgeon was ligating the cystic artery, a severe hemorrhage occurred, which was difficult to control. Finally this was controlled by crushing, in a pair of forceps, a considerable piece of tissue which contained the vessel, and this considerable piece of tissue was ligated *en masse*.

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[1] This case was presented in the SURGICAL CLINICS OF CHICAGO in June, 1917 (p. 553), by Dr. D. B. Phemister.

In about forty-eight hours the patient developed symptoms of common duct obstruction, as shown clearly by the development of jaundice. The surgeon felt that he had probably injured the common or hepatic duct with the ligature or with the clamp, and after the development of the jaundice he sent the patient to the operating room, opened the laparotomy wound, and sought for the ligature which had been used in controlling the hemorrhage, divided this, and removed it in the hope that the removal of this ligature would remove the obstruction to the common duct. At that time it seemed that the part of the common duct grasped by the ligature had lost its blood-supply and would probably slough. Within a few days bile poured out of the external wound and the woman went on to a fairly good operative recovery.

The biliary fistula persisted for months, and finally another operation was proposed—the restoring of the continuity of the common duct. At this operation a T-shaped tube was used; the ends of the divided duct were found and the cross-piece of the tube introduced into the hepatic duct above and down into the common duct below, and the shank of the T-tube was brought out externally, so that the bile could run into the dressings. The jaundice was relieved at once. The tube was left in for several months and finally removed, with the hope that a permanent canal had been established which could carry the bile into the duodenum. At this last operation the operator tried to introduce a tube through the common duct into the duodenum, but was not able to do this, as the tube would not pass through the constricted papilla. I think this may be an important point for consideration. After the removal of the T-shaped tube the jaundice returned intermittently and finally became persistent, and she was referred to me for treatment.

The facts in the case seem to be so clear that we are undertaking the operation with more knowledge than one frequently has in these reconstruction cases. I have thought over the case a good deal and shall attempt to reconstruct the common duct by introducing a tube into the hepatic duct, carrying it into the duodenum after dividing the structures which hinder its entrance, and attempt to form a new canal with an omental or fascial plastic.

The patient has been anesthetized with drop ether and we shall proceed to the operation. I make, as you see, a very large S incision, a little internal to the two scars of the former operations (Fig. 11, 1). It is very desirable to make a wide exposure in operations of this kind. As I open the peritoneal cavity I find that the omentum is adherent to the liver, stomach, and duodenum. I shall proceed very carefully to separate these adhesions. Here I find an adherent piece of omentum that I cannot separate. I clamp and divide it and ligate both ends. Here is another mass of omentum that must be handled in the same way. I shall be very patient and take my time to separate these adhesions and expose the structures completely and, if possible, without injury to any of the viscera. You see it has taken at least twenty minutes to accomplish this. Now I have freely exposed the duodenum, stomach, and liver, and I introduce my finger into the foramen of Winslow. I feel between my thumb and finger the right free fold of the gastrohepatic omentum, which I know should contain the common duct. The gall-bladder has been removed in the previous operation. With a pair of dissecting forceps without teeth I am now freeing this right free fold of the gastrohepatic omentum from the little fat which covers it, and I expose a tube which I think is the common duct (Fig. 11, 1). To make sure I shall introduce a hypodermic needle into it, and I draw out a little mucus but no bile. I am now dividing this tube, which is the common duct, parallel with

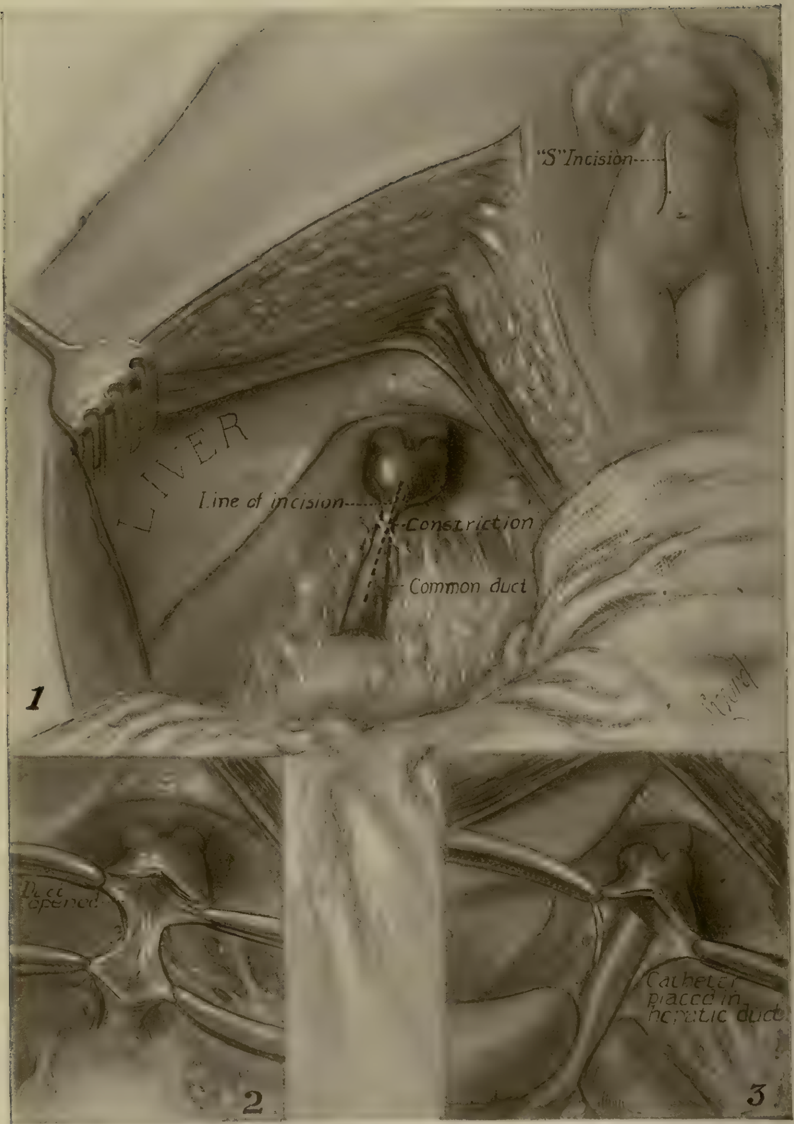

Fig. 11.—The Bevan S-shaped incision, its course on the abdominal wall, and the exposure permitted by it in the present case; note the dilated common and hepatic ducts above site of stricture. 2 and 3. Stricture incised and rubber tube (catheter) inserted into upper end of common duct.

its long axis. I put some fine steel clamps on the edges of the incision and expose to view the interior of the common duct (Fig. 11, 2). Now, with a probe introduced through this incision, I try to find an opening into the upper part of the common duct or into the hepatic duct. I try first a small probe, but I cannot succeed in passing this. I am now trying a filiform bougie, such as we use in urethral stricture, and I cannot pass this. I have asked the nurse to sterilize for me the fine eye probes that are used in strictures of the lacrimal duct, and taking the finest of these and using a very slight amount of force, I find that I can pass it upward through the stricture into the hepatic duct. Taking the larger eye probe, I pass this, and, using this as a guide, I am now dividing the stricture with a knife. The stricture is about $\frac{1}{3}$ inch long, and as I enter the hepatic duct you can see a large amount of clear glycerin-like mucus pouring out into the wound. It is perfectly clear like glycerin. It contains no bile, and I am very much surprised to find this condition. Evidently the liver is not secreting any bile at this time and has ceased to secrete bile because of the great intrahepatic pressure produced by the stricture. The condition is clearly parallel to one of suppression of urine in the kidney from ligating off the ureter, or, from what happens not infrequently, a complete obstruction of the ureter from a ureteral stone. As I say, I have never seen this condition present, though I can readily explain the exact reason for its occurrence.

I have now opened the hepatic duct fairly widely and find it is dilated above the point of stricture. Now I take a No. 12 catheter and try to pass it through the common duct into the duodenum, but I am not able to do this. It is absolutely necessary to do this if we are to succeed in restoring the common duct. I am now trying to pass the probe, and, as you see, I can pass a moderate size probe through the common duct into the duodenum. I follow this up with a pair of curved artery forceps closed and very gently push the forceps through the common duct into the duodenum. I now open the blades of the forceps and stretch the opening at the edge so that I can now pass the No. 12 catheter without difficulty. I cannot help but feel that this is an important step in the operation. To ensure an easy escape of bile into the duodenum I carry one end of the catheter up into the hepatic duct for about ½ inch and stitch it to the outer edge of the hepatic duct with two fine linen sutures (Fig. 11, 3). I then carry the other end of the catheter through the lower part of the common duct into the duodenum and leave about 5 or 6 inches of the length of the catheter in the duodenum, and then with some chromic gut close part of the incision of the common

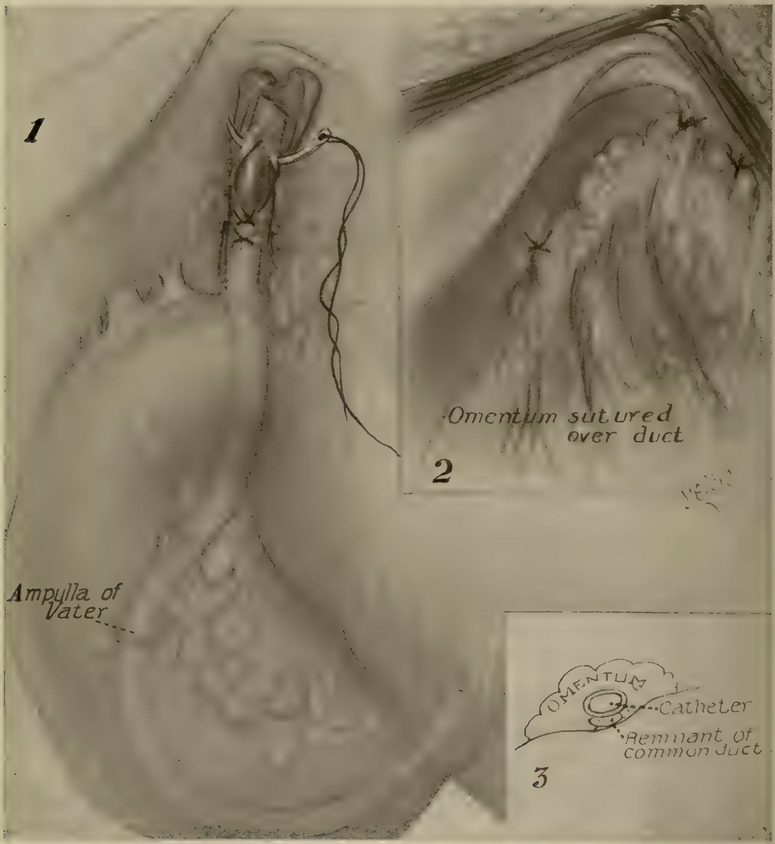

Fig. 12.—1. Tube carried through the distal portion of common duct and through the ampulla of Vater into duodenum. 2. Omentum sutured over defect in common duct. 3. Diagrammatic cross-section of the point of stricture at the completion of the operation.

duct over the catheter (Fig. 12, 1); but for a considerable distance, at the point of stricture, it is impossible to do this. I shall cover this defect in the common duct with a piece of omentum. Fortunately, I can use here the omentum that was adherent to the liver, and I carry this up over the common duct and stitch it in position (Fig. 12, 2). I shall now close the external wound in the usual manner with drainage down to the point of operation with two moderate size cigarette drains.

The problem which confronted us in this case was to form a permanent canal of fair caliber to take the place of the $\frac{1}{2}$ inch or more of common duct that had been destroyed. My conception of the best way to do this is to follow just the technic that we have adopted in this case, that is, to try to establish a canal between the remnants of the common duct at the point of stricture by means of the rubber tube and the omental flap. I shall draw on the board a transverse section of what I hope will happen in this case. You see here at the point of stricture a small remnant of the common duct through which we passed the lacrimal duct probe, and which was sufficient to form but a very small part of the circumference of the canal to be established at this point. Then here is a cross-section of the catheter, and in front of this and surrounding the catheter is the large omental flap (Fig. 12, 3). If the tube will remain in position for a sufficient length of time granulation tissue will form from the remnants of the common duct and from the omental flap around this tube, and then from both the hepatic duct and the common duct epithelial cells will grow from the mucous membrane over this granulation tissue, and eventually form a connective-tissue canal lined with epithelium. I shall be glad if the tube remains for from six weeks to three months, and during that period I shall expect that a permanent canal lined with epithelium will be produced. I hope and believe that the tube, there being about 6 inches of it in the duodenum, will find its way into the duodenum and be passed.

For cases of this kind, after a rather careful search of the literature on the subject, this appeals to me as being the operation of choice. In some cases the direct implantation of the hepatic duct or upper patulous part of the common duct into the duodenum can be made, and where that has been possible it has given excellent results.

Postscript.—The patient went on to a very satisfactory operative recovery. The bile drained externally along the cigarette drains for about two weeks, and when these were removed ceased within a few days, and after this the external wound closed very promptly. The jaundice rapidly disappeared. The patient improved in weight and strength. *x*-Ray pictures taken at the end of four weeks show the tube still in position.

AN OVERLOOKED COMMON DUCT STONE

I now want to show you a postmortem specimen removed recently from a case of obstruction to the common duct where an attempt had been made by one of our best abdominal surgeons to reconstruct the duct, and where later I made an exploratory operation for the same purpose, but found conditions such as to make it impossible to do any operation on the duct itself. This specimen was obtained from a woman who died on my service a few weeks ago. The history was that a cholecystectomy had been done several years ago for gall-stone disease. This was followed later by the development of jaundice, a jaundice which was at first intermittent and finally became persistent. She was taken to a surgeon of large experience in this work, who made a direct anastomosis between the hepatic duct and the duodenum, but without relief. Later on, analyzing the condition, it was thought that she was suffering not from an obstruction of the duct, but from some lesion involving the entire parenchyma of the liver—some form of cirrhosis. Later she was brought to Dr. Sippy's service. After studying the case with a great deal of care he came to the conclusion that it was not a general disease of the liver, but that the jaundice was due to an obstruction of the common duct, and asked me to operate on the case.

At the time of operation we found very dense adhesions all about the liver and stomach, duodenum, transverse colon, and omentum, which required fully an hour to separate, before we could come down even to the location of the common duct. Then we opened into an abscess containing pus and small irregular flakes of material that looked like cholesterol. The patient was in such bad condition that we simply drained the abscess. She had been suffering for weeks from a profound cholemia, and finally died from the cholemia and the development of a duodenal fistula about three weeks after the operation.

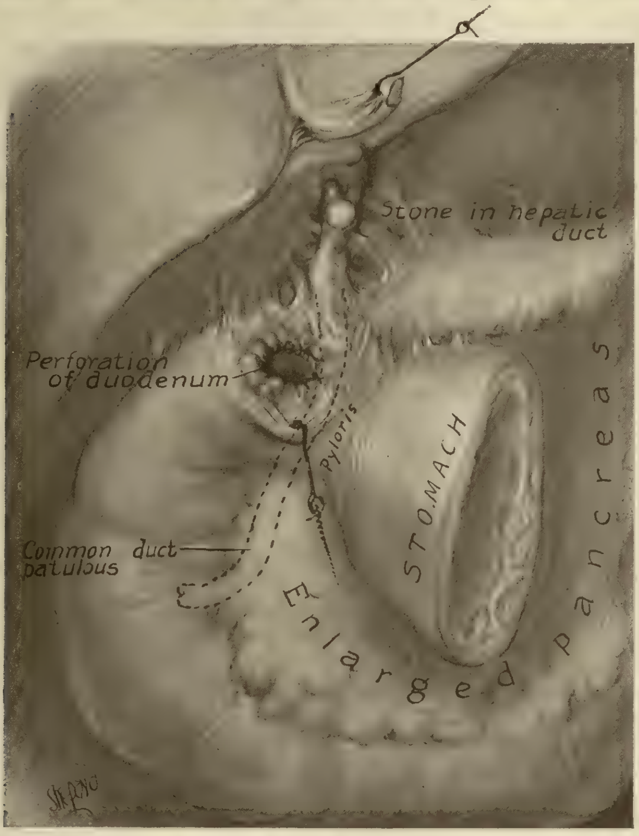

Fig. 12A.—Drawing of region of bile-ducts made at postmortem. The overlooked stone in the hepatic duct in a reasonably accessible location was the cause of the death of this patient. The defect in the duodenum probably represents the point at which the Sullivan tube had been carried into the duodenum in the operation for the repair of a supposedly obstructed common duct.

A very interesting condition of affairs was found at the postmortem. An opening was found in the duodenum probably at the point where the surgeon had made the anastomosis between the duct and the duodenum. The common duct was patulous throughout. There was no stricture and no carcinoma, but at the junction of the right and left hepatic ducts and blocking up the beginning of the common duct entirely was a small stone, which you see in this specimen (Fig. 12A).

There is a moral which I should like to draw from these two cases, and that is, first the importance of doing cholecystectomies with very free wide incisions, so that the cystic duct and cystic artery can be completely exposed when they are ligated without carrying any risk of injury to the hepatic or common duct. Many of these cases where restoration of the common duct becomes necessary are cases in which with a wider exposure and a little more care injury during cholecystectomy could have been avoided. In the second place, as illustrated by the specimen which I show you, in all cholecystectomies we should examine the common duct and hepatic duct for stones, and where these are found they should be removed at the same sitting. Of course it is impossible, even in the hands of the greatest expert, to avoid leaving stones sometimes in the hepatic or common duct, and I am rather inclined to think that, in the specimen which I have shown you, the stone is so small and situated so high up that it was practically impossible for the surgeon to discover it at the time of the operation. At the same time it is possible that with a small scoop it might have been removed if one had in mind the possibility of the existence of such a condition. I think one should, where the common duct is open, make it a rule to pass a probe from the incision in the common duct into the duodenum and then up through the hepatic duct and to attempt at any rate to determine the existence of stones. If these are found, of course their removal with proper scoops is, as a rule, possible.

Reconstruction of the common duct for carcinoma has had a very narrow field. We seldom if ever find a carcinoma of the common duct so small that it can be resected and the patient cured. As a rule in these cases the operation is necessarily palliative and should be either a cholecystenterostomy, where this is possible, or a cholecystotomy where there is difficulty and the condition of the patient does not warrant prolonged operation.

GALL-STONE ILEUS

Summary: A patient with symptoms of intestinal obstruction of three days' duration; exploratory laparotomy under novocain and discovery of large gall-stone in lower ileum; remarks on gall-stone ileus.

THE first case which I shall operate upon this morning is a woman of about sixty who was brought into the hospital last night suffering from what appears to be an attack of intestinal obstruction from some unknown cause, and as yet I have not been able to determine the anatomic location. Three days ago she was attacked with pain and vomiting and she has a very slight temperature. The leukocyte count is about 12,000. She has pain of a very moderate degree at the present time, and is but very little distended. Her abdomen is not rigid. She continues to vomit. The attending physician, who brought her here, found it was impossible to secure either with enemas or cathartics any bowel movements. We have been unable to locate anything in the large intestine in the way of a carcinoma. Rectal examination fails to disclose anything in the rectum or the pelvis.

She gives an old history of previous abdominal attacks years ago, which may or may not have been gall-stone attacks. The history is rather vague, and simply that years ago she had for a period repeated abdominal attacks lasting for a few hours. There is no history of an appendiceal lesion or of anything wrong with the uterine appendages.

After studying the case carefully I am unable to arrive at a definite diagnosis. I believe, however, that she has some obstruction, and that the wise thing is to make an exploratory operation and determine the cause of the obstruction, and to remove this if it is then found. She is very weak and not a good subject for a general anesthetic. I shall, therefore, because she complains of more tenderness in the left lower quadrant, make a muscle-splitting incision in that position under local anesthesia.

I am infiltrating now the line of incision with $\frac{1}{2}$ of 1 per cent. novocain in sterile water to which we have added about 1:100,000 adrenalin solution. You will notice that the first injection is made with a fine needle and a small hypodermic syringe, such as is ordinarily used for morphin. This is followed with a larger needle and a large syringe, and I shall not hesitate to employ 3 or 4 ounces of this solution in infiltrating the abdominal wall. I now make an incision about 6 inches long on the left side, just as we would make an ordinary oblique muscle-splitting incision for an appendix operation on the right. The skin and superficial fascia are divided and the external oblique exposed. This is infiltrated with some more of the novocain solution. The external oblique is now divided, exposing the internal oblique, which is infiltrated again with novocain. The fibers of the internal oblique and transversalis are now separated and the peritoneum exposed. I now infiltrate the peritoneum with a fine syringe. I want to call your attention to the importance of this step, because the parietal peritoneum is very sensitive and the mistake is not infrequently made, in doing laparotomies under local anesthesia, of not anesthetizing the parietal peritoneum separately before incising it. I now divide the peritoneum and a large distended bowel comes into view. I examine this and find it is a greatly distended coil of small intestine. I now wet my gloved hand so that it will slip more readily through the incision and into the abdominal cavity. I very gently palpate the structures within the abdominal cavity, and I at once come down to a hard, firm mass that feels about the size of an English walnut. This seems to be quite movable. I very gently draw it out through the incision, and as I bring it into view you can see that I have a coil of small intestine in my hand, and between my thumb and finger I have a hard body about as large as an English walnut and irregular (Fig. 13), and through the semitransparent intestine I can make out without any difficulty that this is a large gall-stone, which has blocked up the intestine, producing a picture of obturation ileus.

I bring this coil of intestine into view and place an intestinal clamp (Fig. 14, *a*) upon a coil of intestine about 5 inches long, including the stone. This prevents the escape of any intestinal contents. I wall off the field very thoroughly with several abdominal pads and make an incision in the intestinal wall parallel with its long axis and exactly opposite the mesentery. This incision is about 1 inch in length, and you see that I can now without difficulty push the stone out through the incision and palpate it.

Examination shows that it is a single large stone without any facets. It has a number of small projections on its surface about the size of grains of wheat (Fig. 14, *b*), giving it a sort of mottled appearance. It evidently was formed as a single large calculus in the gall-bladder.

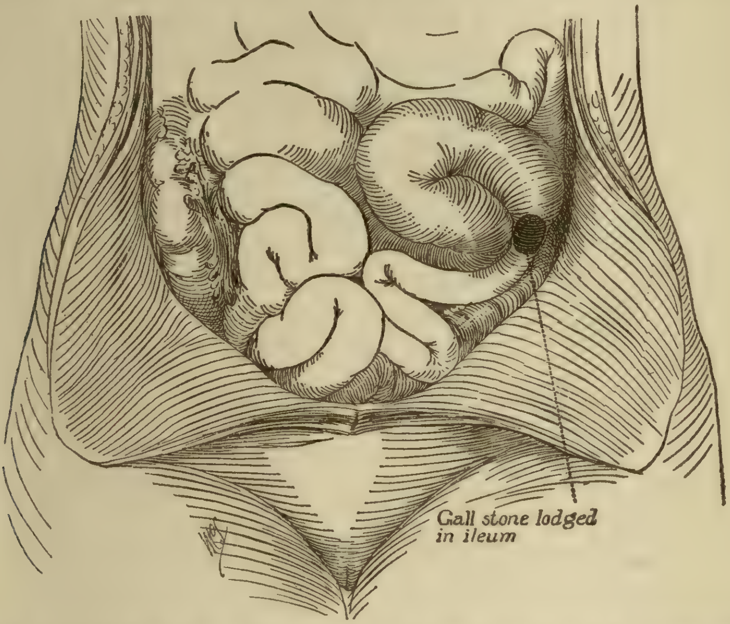

Fig. 13.—Gall-stone ileus. Note dilatation of bowel above point of obstruction.

I now close the incision in the intestinal wall by two rows of sutures (Fig. 14, *c*) and drop the loop of intestine back into the abdominal cavity. We close the incision in the usual way, just as we would an appendix incision, leaving, however, a cigarette drain passing through the center down into the peritoneal cavity.

I would like to take the opportunity of saying a word or two about these cases. I have seen a half-dozen or more similar cases of obturation ileus produced by gall-stones. The history of the course of events is this: A large gall-stone forms in the gall-bladder, as large as this one or sometimes larger, and sometimes without very acute previous attacks; usually, however, with a history covering a number of years of gall-stone colic attacks. Sometimes, however, with acute symptoms and sometimes with very slight or no symptoms the gall-bladder becomes attached to the duodenum or to the transverse colon and sometimes to the stomach, but this is rare, and by pressure-necrosis the gall-stone ulcerates its way from the gall-bladder into one of these hollow viscera, the process evidently being a gradual one and

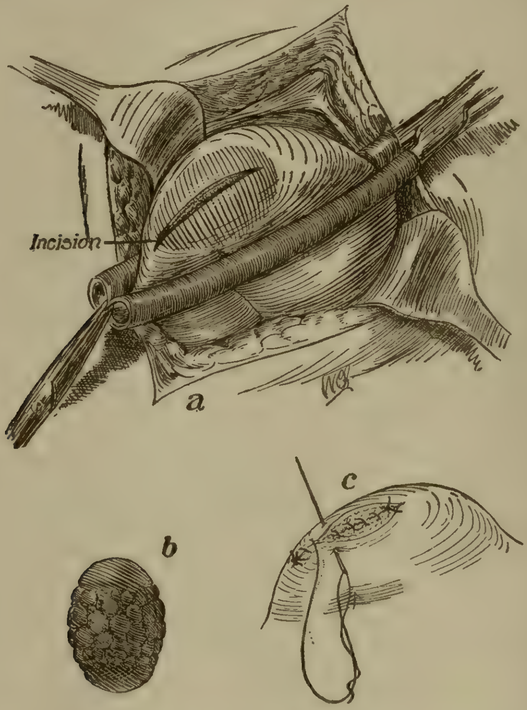

Fig. 14.—Removal of gall-stone causing the obstruction. Incision in bowel closed by two layers of sutures.

requring some time. I have been fortunate enough to find in two instances that the stone in the gall-bladder ulcerated its way into the duodenum, so that it was partly in the duodenum and partly in the gall-bladder. Eventually the stone passes into the viscus. If it passes into the transverse colon it invariably is passed per rectum without any difficulty. If, on the other hand, it ulcerates into the stomach or ulcerates into the duodenum, it passes along the small intestine for a short distance, depending upon the size of the stone. You will remember that the duodenum and jejunum are of much larger caliber than the ileum and there is a gradual diminution in size of the small intestine from the duodenum down to the ileocecal valve. As the gall-stone is carried along by the peristalsis of the small intestine, if it is of sufficient size it eventually reaches a point in the small intestine, which is gradually diminishing in size, where it becomes arrested and produces obstruction. The obstruction is of a pure obturation type, that is, at first simply obstructing the caliber of the small intestine without producing interference with its circulation. The symptoms of obturation are, as a rule, of moderate degree as compared with those of strangulation ileus. If the picture persists, the patient may die from toxemia and the absorption of the toxins developed in the obstructed bowel above the gall-stone, or general peritonitis may develop and be the immediate cause of death. Where the condition is recognized, of course operation and removal is, as a rule, simple, is very clearly indicated, and gives an excellent prospect of cure.

This form of gall-stone ileus with its definite mechanical cause is but one of the forms of ileus that can be produced by gall-stone disease. We have had a number of cases of paralytic ileus associated with gall-stone disease where local peritonitis or extensive peritonitis around the gall-bladder produced paralysis of the intestine with the resulting picture of ileus. As a rule these cases pass on to recovery, but sometimes the paralytic ileus is persistent and fatal.

RUPTURED EXTRA-UTERINE PREGNANCY—CONFUSION WITH APPENDICITIS

THE next case which I shall show you is a young woman of about thirty and very stout. She must weigh 240 pounds. She comes to us with an acute abdominal attack coming on forty-eight hours ago without much temperature, great pain, so severe that the patient had to go to bed at once, some vomiting, and distinct tenderness over the region of the appendix. She has been married for six years and has never been pregnant. There is no history of any pelvic disorder, and I am rather inclined to regard the case as acute appendicitis, although I think we should take into consideration the possibility of an involvement of the right uterine appendage.

Under general anesthesia I shall make a muscle-splitting incision over the appendix. I am doing the usual muscle-splitting method. You notice, however, because of the great thickness of the abdominal wall, the edges being 3 or 4 inches thick, that it is necessary for me to make a very long incision, 6 or 7 inches in length. I now open the peritoneal cavity and, rather to my surprise, the first thing that comes into view is free blood. The blood evidently is not very fresh, because there are some clots in it, and it must have been poured out into the peritoneal cavity twenty-four or forty-eight hours ago. Before going any farther I want to say that this changes my view of the case, and I am inclined to think now either of an extra-uterine pregnancy or a hemorrhage from a ruptured graafian follicle associated with an ordinary menstrual period, but without an extra-uterine pregnancy. We have had several of these cases where women have been brought here with acute abdominal pain where we have thought either of an appendix or an extra-uterine pregnancy, and have found on operation an ounce or sometimes several ounces of blood in the peritoneal cavity around a ruptured graafian follicle. As I pass my hand down into the pelvis I feel a mass which is much larger than a normal ovary. As I bring it into view you will see that it is the distended tube and that we have to deal with a tubal pregnancy (Fig. 15). I clamp off the tube and remove it. I am leaving, however, the ovary on this side. I now examine the other appendages and find the left tube and ovary are quite normal. I shall close the abdomen in the usual way without drainage.

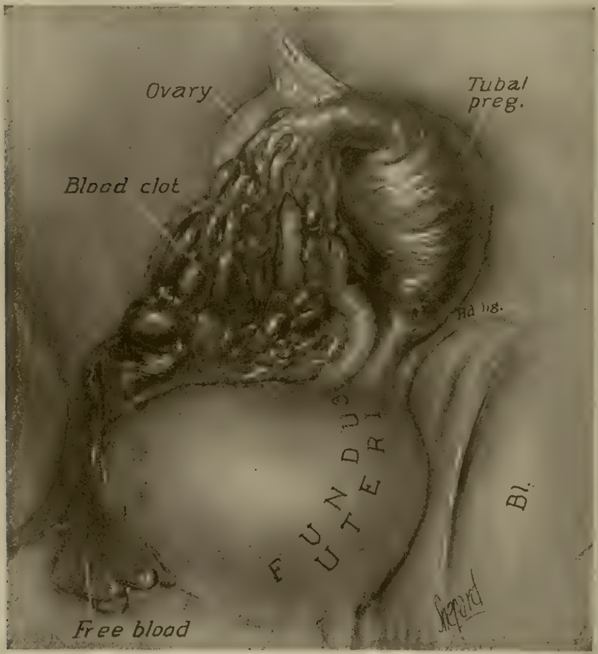

Fig. 15.—Extra-uterine pregnancy discovered at operation. Location of blood-clots about fimbriated extremity of tube suggests that we are dealing with a tubal abortion.

I find that there is $\frac{1}{2}$ pint of blood and blood-clots in the lower abdomen. These are very gently and carefully removed with moist pads.

BENIGN STRICTURE OF RECTUM—TREATMENT BY DILATATION UNDER ANESTHESIA AND TRANSPLANTATION OF MUCOUS MEMBRANE

The next case which I shall show you is a case of benign stricture of the rectum. This is a case that has been under medical management for some time. Bougies have been used, but it has been difficult to keep the stricture open, and the patient has suffered a good deal in general health because the bowels have not moved regularly. One of the chief complaints has been symptoms of intestinal toxemia because of the failure to have regular and complete bowel movements. The stricture is very short. I have just examined it and find it extends only about 2 inches up the bowel, and apparently beyond that point there is either the normal caliber or even the dilated caliber of the rectum.

I have planned out for this case a procedure which is new and which, it seems, will fit the indications and probably permanently cure the condition. I wish you would follow me carefully as I do this operation and I shall attempt to make the details of the procedure clear. My purpose is to dilate very fully and widely the rectum at the point of stricture, and then to free the mucous membrane of the dilated rectum above the point of stricture for an inch or more, and bring it down and unite it to the margin of the anus, very much as one would do a Whitehead operation, except that no mucous membrane will be removed. I shall dilate the stricture with this small rectal speculum and then with a large rectal speculum (Fig. 16, *a* and *b*). As I dilate the stricture very fully with this large rectal speculum the mucous membrane at the site of the stricture ruptures, exposing a raw surface uncovered by mucous membrane about 1½ inches in width, extending from the mucous membrane of the dilated bowel above the stricture to the anus. I now bring the mucous membrane of the dilated bowel above the stricture down with the forceps, and then with mattress sutures of black linen I sew this mucous membrane to the margin of the anus (Fig. 16, *c*, *d*). It is rather interesting to note what a small amount of mucous membrane sufficed to cover the stricture. It remains anteriorly on the rectum, and it has been necessary for me to cover the pos-

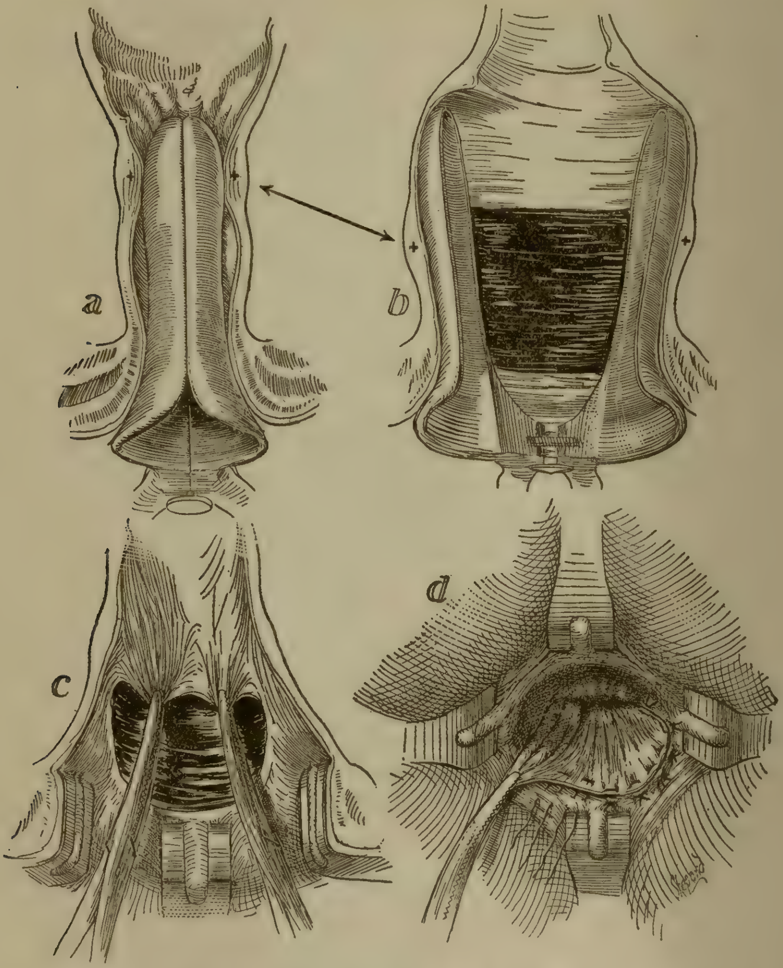

Fig. 16.—Benign stricture of rectum. *a*, Site of stricture. *b*, Dilatation of stricture—shaded area represents rent in mucous membrane incident to the dilatation. *c* and *d*, Pulling mucous membrane down and stitching it in position to cover denuded area.

terior three-fourths of the circumference with my new mucous membrane flap. You will see that the rectum now has a large caliber at the point of previous stricture.

I am inclined to believe that this operation has a very distinct field. Of course, necessarily a narrow one, as the field would be limited to cases where the stricture is short and where you can bring the mucous membrane of the comparatively normal bowel down to the anal margin.

It will not be necessary to remove these short black linen sutures, as they will come away themselves in eight or ten days. I believe, however, it will be desirable to pass a rectal speculum gently into the anus and dilate it moderately every two or three days during the closing days of wound healing, beginning, let us say, at the end of the week, until wound healing is complete.

Postscript.—The result in this case seemed to be admirable. I believe, however, that here, as in all these rectal cases, the case should not be lost sight of, but should be kept under careful observation for a considerable period, and moderate gentle dilatation with the speculum carried out to ensure against subsequent stricture.

CLINIC OF DR. L. L. McARTHUR

St. Luke's Hospital

(Surgical Congress of North America, October 24, 1917)

OPERATIVE CLINIC DEMONSTRATING PRACTICAL POINTS IN CONNECTION WITH NEPHRECTOMY AND RESECTION OF THE COLON

Summary: Case I. A patient with severe, persistent hematuria, not influenced by medical measures, and a history of repeated attacks of renal colic with passage of stones per urethra; the probable diagnosis; reasons for suspecting neoplasm; nephrectomy.

Case II. Carcinoma of the hepatic flexure of the colon producing obstruction with increased intra-intestinal pressure and rupture of a Meckel's diverticulum; first operation: Ileocolostomy with resection of diverticulum; convalescence complicated by fecal fistula. Second operation: Resection of terminal ileum and fecal fistula together with large intestine up to and including hepatic flexure with tumor.

One cannot refrain from expressing the appreciation and honor that one feels in having the celebrated men of the world come to this humble clinic. I must call your attention to the fact that we have Sir Berkeley Moynihan, Col. T. H. Goodwin, the representative surgeon of the British Army, and Col. Dercle, representing the French medical service, here this morning.

Case I.—The patient, a married man of sixty-four years, has complained of hematuria for the past few weeks. He first noticed urinary symptoms four years ago, when he had backache and pain in the region of the bladder. This was relieved after passing some small stones from the urethra. Since then he has had five similar attacks. The latter part of April, 1917, he noticed that the urine contained blood. It became more bloody during June and July. This was not accompanied by pain. Since April he has been losing weight and becoming gradually weaker.

Past History.—Usual diseases of childhood; smallpox at seven; pleurisy at fifty-six.

Family History.—His wife and six children are living and well. Father died at the age of eighty-one.

Habits.—Uses tobacco moderately and alcohol very moderately.

Dr. McArthur: You have heard the history. The patient is a phlegmatic German weighing about 200 pounds. His anemic condition was so pronounced when admitted that I did not dare submit him to any operative risk. His hemoglobin was down to 36 per cent. and his red corpuscles to 1,900,000. After about three weeks of rest in bed, medication, and tonics we have improved conditions so that blood examination now reveals 48 per cent. hemoglobin and 3,200,000 red cells. In the *x*-ray plate an outline of the left kidney is to be seen; there is a distinct shadow. There is a history of having had five ureteral colics and having passed small stones. Naturally, the conclusion is that he has a stone in the kidney, but the anemia is so pronounced and the hematuria so persistent that I cannot free my mind of the idea that he has a hypernephroma and that this kidney will have to be extirpated. The shadow showing in the *x*-ray plate is low—in the lower pole of the kidney—and it is not as frank as stones in the kidney usually are. A persistent flow of blood from stones in the kidney when the patient is absolutely at rest is not, in my experience, a common thing. The kidney is rather tender on palpation. Though the patient is very big and fat and difficult to palpate, yet I think there is some enlargement of the kidney as well as tenderness of it. It is not a case that one would pick out for clinical demonstration. The operation is going to be a difficult task. It would not surprise me if at the operation or soon after he would die, but we cannot check this hemorrhage by any known medication, and there is nothing left but surgical interference.

The cystoscopic examination made last evening shows normal urine coming from the right ureter, and almost pure bright red blood from the left. The blood was coming so freely that the washings of the bladder could hardly be made clear enough to utilize the cystoscope.

Operation (*Oblique Lumbar Incision*).—The fatty capsule around the kidney is found to be infiltrated and very firmly attached to the kidney. With the kidney exposed we find conditions very suggestive of malignancy. The organ feels rather soft and fluctuating. The question is whether we should remove such a kidney without delay or incise it for the purpose of exploration first. I have the rest of the kidney out of its capsule, after considerable effort, and find the lower pole to be soft and fluctuating, but presenting, as does the rest of the kidney, the appearance of a possible malignancy. On palpation I do not locate any stone, but when the kidney is collapsed I may be able to. Good judgment must be shown here in determining whether we should attempt to save this kidney by drainage or not. Mr. Moynihan is of the opinion that if it is left in, it will probably have to come out later. That is my impression also. With the kidney removed, I split it open, and you see what is on the inside. The lower pole of the kidney is disintegrated and has stones in it—a number of small stones. I am convinced that the suggestion of Mr. Moynihan is good, that this would be a surgical kidney always. It does not look like a simple involvement of the portion of the kidney which contains the stones, but as if there were a papillomatous or carcinomatous growth there also.

Experience has taught me that the procedure of ligating the pedicle of a kidney should be most thorough. Be sure that you have the pedicle well encircled before taking off the forceps. For that reason I have taken a longer time to do this step of the operation than probably seems justified. In this particular case, the patient being extremely anemic, I am more desirous than usual that there shall be no secondary bleeding. There is still a little oozing at the pedicle which I do not feel justified in leaving.

In these very stout patients you have to make a transverse or almost transverse incision, by which you cut all three of the abdominal muscles. As you know, you have to cut in such a fashion that you will not injure the iliohypogastric and ilioinguinal nerves as they come down in an oblique direction in the abdominal wall. We now insert a drainage-tube and close the wound in the usual way.

Pathologist's Report.—"Papillocarcinoma of kidney springing from pelvis."

Case II.—We have for our next patient a doctor who for two or three years has suffered with periods of intense vomiting preceded by symptoms of intestinal obstruction. When he got his bowels to move he would be all right. He entered St. Luke's in May with intestinal obstruction. The vomiting was fecal in character. I advised him at that time to have surgical interference, first trying to repeat his experiences of washing out the colon and getting him back into a seminormal condition so that we might ascertain the location of his intestinal obstruction. We were fortunate enough working the first night—he came in before midnight—in finally getting a bowel movement before morning, thus getting him into shape so that we could make an *x*-ray investigation of his intestinal tract. We found a stricture at the hepatic flexure of the colon. After two or three days' colonic washings he was better, with the tenderness, however, always at the hepatic flexure of the colon. After studying the *x*-ray plates we decided that his trouble was, in all probability, a neoplastic obstruction, not an adhesive obstruction from an inflamed gall-bladder, which was his diagnosis, because he had had pain immediately beneath his gall-bladder for two or three years. He decided that he would not be operated on and went home.

Two or three weeks ago he came back with a high temperature, a leukocyte count of 22,000, and an acute obstruction. One day prior to admission when stooping over he felt something give way in the abdomen. He stayed home suffering a great deal of pain for forty-eight hours, with a high temperature and all the evidences of a peritonitis, and later came to the hospital in that condition—a peritonitis associated with what we knew to be an obstruction of the hepatic flexure of the colon. The only thing we could do would be to open the abdomen and endeavor to relieve the obstruction.

On opening the abdomen we found not only the ascending colon greatly dilated, but a loop of ileum at least 12 or 16 inches long was also dilated, quite as large as the colon which it paralleled. It extended so far we had to go 18 or 20 inches back on the ileum in order to make an anastomosis between the transverse colon and ileum. When opening the abdomen we found plastic lymph, pus, and all the evidences of an acute recent inflammation in the zone reaching from the umbilicus to the midportion of this dilated 16 inches of ileum, which gave us the impression of a Meckel's diverticulum, that apparently, under the backward pressure due to the obstruction, had ruptured and made this inflammatory process. We resected this zone, closed the hole in the distended ileum with purse-string sutures, and inverted it with a Lembert suture. On the seventh or eighth day after the operation a fecal fistula developed, though the bowels had immediately begun to move through the short-circuit route.

There remains now this situation: The anastomosis of the ileum and transverse colon, a carcinoma of the hepatic flexure of the colon, a septic process and a fecal fistula at the point at which this diverticulum—probably a Meckel's diverticulum—was located. I feel that had he entered at the time we urged him he would probably have escaped both the septic process and the fecal fistula and probably would have been relieved of his carcinoma.

On questioning him as to any trouble with his umbilical region, he said that his mother told him that as a child, or rather when he was born, there was the greatest trouble experienced in the care of his umbilicus. There was something wrong with his navel that lasted into his second or third year. His mother is dead, so we cannot get any definite information, but I rather think he had one of those persistent ducts which make a true Meckel's diverticulum.

I will have to reopen the field, making an effort to be as cleanly as possible, septic as it is. We must give the patient one chance for his life. I hope that the anastomosis which we have made for him will enable us also to follow this bowel, which was enormously distended at the time of the operation. The inflammatory trouble, as you know, produced an adhesion to the anterior abdominal wall and we had great difficulty at the time in separating it from the umbilical area. I am slowly dissecting loose the adhesions of the ileum and ascending colon from the anterior abdominal wall. I must reach the caput coli and see if I can begin to extirpate. I have now exposed the posterior wall. There is an abscess leading down beyond the caput coli. I pack off that sinus. Now I am loosening up the omentum that is plastered around the ascending colon and dilated ileum. I have to get it out of my way. I have the remains of the diverticulum of the ileum which I am removing. I have ligated it and will now bury the end by putting a purse-string around it. I am trying to reach the line of junction between the transverse and ascending colon, so that I may determine where I can incise the bowel and start extirpation.

The statistics carefully worked out by the Germans have shown that omental amputation has a definite mortality. If during an operation—hernia, for example—you have to ligate off a very considerable mass of omentum the mortality of that operation is increased 40 per cent. I told you that at the former operation I made an anastomosis between the ileum and the transverse colon. I find now that I have reached that point. We will have to amputate the bowel at that position, turn in the ends of both limbs, and then excise the abdominal tumor. I now apply the intestinal clamp on the proximal side of the anastomosis in order to prevent further fecal staining of the field. I separate the peritoneum from the lateral abdominal wall so I can mobilize the colon inward. In this step one must be cautious about the ureter.

At the time of the first operation we found a very distended appendix. At that time I spoke of the desirability of making a safety-valve at the appendix, but, unfortunately, did not do so. Had I done so I am quite sure we could have relieved all the tension in that loop and prevented the fecal fistula. That was my error in judgment. The tumor mass is still to be felt. It is not unusually large. One tries to save as much of the parietal peritoneum as one can, otherwise an extensive raw surface is left on the abdominal wall for the small intestine to become plastered to; the adhesions which may result are a serious thing in the convalescence.

Here is the fistula. It did not occur at the anastomosis. It occurred at the point where the diverticulum had ruptured. Whether this was a congenital diverticulum or not is not determined. I am leaving probably more of the mesentery than ordinarily because that will make a good covering for the posterior abdominal wall. Ordinarily this segment of bowel with its mesentery would be taken out by a V incision, but I want to preserve more of the mesentery to act as a covering for the denuded abdominal wall, and I therefore divide the mesentery at the mesenteric border of the intestine. The entire loop of bowel which has been side-tracked at the first operation is now removed. You see, this includes the terminal 14 inches of ileum, the cecum, ascending colon, hepatic flexure with the carcinoma, and a portion of the transverse colon. I close the abdomen in layers, making provision for abundant drainage.

Postscript.—Patient is making a good but slow recovery. Pathologist reports carcinoma of colon, annular in character. January 28, 1918, patient reports himself well.

MAJOR KELLOGG SPEED

A CLINICAL TALK GIVEN AT NO.———[1], BRITISH EXPEDITIONARY FORCE, ———[1], SEPTEMBER 25, 1917, SECOND IN THE REGULAR SERIES OF MEETINGS OF THE MEDICAL OFFICERS OF THE BRITISH ARMY IN THIS DISTRICT

GUNSHOTS OF THE HEAD, WITH ESPECIAL REFERENCE TO INDICATIONS FOR OPERATION AND TECHNIC. DEMONSTRATION OF CASES

Summary: Choice of the anesthetic—superiority of general anesthesia with ether; a simple classification of gunshots of the head: (*a*) Non-penetrating, skull damage acknowledged, (*b*) penetrating brain; mechanical pathology—shock, hemorrhage, trauma, foreign bodies; bacteriologic pathology—usually secondary; operation with opening of dura questionable in absence of decisive intracranial symptoms; gutter wounds—frequent scattering of inner table of skull with but slight damage to outer table; the "tumbling" bullet; treatment of foreign bodies—how bacteria are carried into brain.

OUR commanding officer, Colonel ———, has very kindly asked me to address you at the regular meeting of our district when it comes the turn of our station to act as host. For that international courtesy, as an American, I am greatly obliged, because every American considers it his greatest and most sacred privilege to talk.

Since the inauguration of these quasiclinical meetings a week ago it has been hoped that each medical officer would take up—either as an independent speaker or in discussion—points of intense interest to him, which look toward refinements of the service. Undoubtedly we are very fortunate in being attached to this group of clearing stations toward which is directed the steady stream of head injuries, and if we fail to improve technic, pathologic knowledge, and our interpretation of clinical findings we are falling short of our full duty.

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[1] Deleted by censor.

Indication for operation and technic are my interests. Today I wish to ask you something about operative indications, referring to technic only incidentally in so far as it is intermingled with the other. Perhaps we all agree on operative investigation of every gunshot wound of the head. Every one recognizes that a scalp wound may cover serious pathology, and as war surgeons it is our duty to excise early all soiled and tousled wounds of battle regardless of location. Whether these scalp wounds, where penetration is uncertain and roentgenogram is negative, should first be investigated by excision under a local anesthetic is a point for each man to decide for himself. Personally I believe in the general anesthetic. The patient is put to sleep; in a few seconds the scalp wound can be excised, and if there is no skull damage or indication for skull opening, the anesthetic is stopped, and before all stitches are in the patient is regaining consciousness and the anesthetist has moved on to the next table. When local anesthesia is used time is consumed waiting for its effect; if further operative steps are needed, the field must be disarranged to permit the anesthetist to step in, so that technic is interfered with and valuable time of the operator is lost. In the rush work of clearing stations each operator's time should be conserved as much as possible because that means more wounds subjected to early treatment with consequent better prognosis.

Taking a very broad viewpoint in the subject of operative indication, let me refer you to a simple classification in head gunshots:

(*a*) Non-penetrating—of the dura and brain—skull damage acknowledged.

(*b*) Penetrating brain.

Our basis for operation must be, after all, a pathologic one. A working pathologic analysis of war wounds of the head may be divided thus:

(1) Mechanical pathology of gunshots.

(2) Bacteriologic pathology, usually secondary.

(1) Mechanical pathology concerns largely the patients we receive a short time after injury, and is of greater interest to

us because bacterial action has not yet entered as a factor. The factors which *are* present and which must be considered are:

(*a*) Shock—concussion.

(*b*) Hemorrhage—of any degree, with special reference to its effect on intracranial pressure.

(*c*) Mechanical injury of vital portions of the brain and tissues about or remote from the missile track.

(*d*) Presence or absence of foreign bodies—as metal, bone, cloth, etc.

In looking back on my month's experience here it seems to me that not enough emphasis is laid on Sir Victor Horsley's work done in 1908 covering the mechanical damage to brain tissue from gunshots. Reference will be made to that later.

Assuming then, for convenience, the division into mechanical pathology, which concerns us so largely in these primary wounds under discussion, and the bacteriologic pathology which is secondary, let us return to the question of immediate operative interference. There is no desire to make an exact definition of indications, merely one to bring out discussion of various points illuminated by our individual experiences. Let us refer to Major Cushing's statement of last week—that after excising scalp wounds and removing depressed or damaged bone, we should proceed to open the dura when subdural hemorrhage or cortical contusion is suspected, even though that membrane be intact. Should we do this in operative work in the face of gunshot wounds and latent infection? I believe not. Although I have performed this step many times, washing out clots and searching with a director, closing the dura afterward, and, for the most part, have obtained very happy results, it does not seem necessary.

Moreover, on the other hand, during a rush of work last year at the time of the Somme push many instances of head injuries came into my wards on which there was not time to operate, and after balancing up statistics some weeks later I found that the mortality among unoperated patients, even in many where scalp incisions were not practised and where foreign bodies lay in the brain, was decidedly lower. That was partly explained by the fact that only the most severe lacerated wounds were operated on; even those with brain penetration, without urgent symptoms, were put to one side or sent over to England.

The investigations of Lieutenant-Colonel Warren and his report to the Director General, Sir Alfred Keogh, last year was quite interesting. He followed over 1200 patients from France to England and most closely recorded the results in at least 600 of them, concluding that many head operations in France were worse than useless, that a great many patients did better without operation, in that they avoided the great danger of hernia cerebri. Ultimate neurologic complications among unoperated patients were found to be surprisingly small.

Since 1916 the plan of early surgical procedure accomplished by "team" work, such as we are engaged upon, has come into vogue. The results are even more surprising than those given by any non-interference methods, I believe, and accord with the experience of the French.

In wounds of the skull in which the dura does not seriously lose continuity and the brain is not penetrated, may we not expect that subdural clots will be absorbed as blood extravasations are elsewhere in the body? If decisive cranial symptoms are lacking, why should we open the dura to wash out these blood collections? Do capillary hemorrhage and cortical edema demand operation—will these conditions not adjust themselves as concussion does? We must remember that the highly organized brain tissues are enclosed in a fairly non-elastic bag of dura—and the whole enclosed in the non-yielding skull, so that dangers of threatening increase of intracranial pressure must be given relief. Nor do we mean to include recognized middle meningeal hemorrhage or patients showing signs of severe brain injury with rising blood-pressure, a slowing pulse, or other evidence that they are on the verge of physiologic circulatory breakdown and are making all efforts to establish normal circulatory conditions in the offended brain by these accessory pressures. Let me repeat that it is in instances of absence of decisive cranial symptoms that dural opening is questionable.

Let me show you this brain recently removed. The man suffered a slightly depressed fracture in the left parietal region from gunshot wound. That was excised, soiled and depressed bone was trimmed away, and in absence of dural damage no further operation seemed indicated on the head. He had, however, suffered a contusion of the left flank and presented a bruised area over the left lower ribs, with abdominal rigidity on the left side. A laparotomy was performed, an incomplete rupture of the ileum was sutured, and a small tear in the spleen repaired. The operation was not long and he was sent to the ward in good condition. Death followed in forty-eight hours. At autopsy the abdomen showed no peritonitis, no accumulation of hemorrhage; the sutured gut was intact. The brain, as you see, shows no clots beneath the site of fracture, which was here in the parietal region, but there are small hemorrhagic areas near the midline, remote from the wound, small in extent, with some generalized cortical edema. Would temporary opening of the dura have relieved these so far away—because there was every indication to *close* the dura again? If the man died of the head injury, would opening of the dura have saved his life? I cannot say; but I do believe that no true permanent decompression of the cortex can be accomplished without opening and *leaving open* the dura. In war wounds, even with wide excision of battered tissues, ought we thus leave open the unwounded dura and cover the defect with scalp when we are *never* sure about the sepsis? Under conditions of civil life, with an intact clean scalp, it is my practice where decompression is indicated to do it either at the site of fracture or in the subtemporal region, remote from the fracture at the site of election, leaving the dura open and closing the scalp perfectly. It would be difficult to say whether an additional decompression in the temporal region would have favorably affected this man's course.

Gutter Wounds Causing Skull Fracture.—In gutter wounds of the skull may we not add one further point of observational importance? Major Cushing mentioned his surprise at the greater comminution and scattering of the inner table in some instances, when the outer table showed small evidence of damage. These examples I presume he meant as different from the usual type of depressed fracture, where it is commonly understood that the inner table constantly suffers greater damage. We must more carefully consider the cause and mechanism of each wound. By that is meant partly the type of missile involved. Gutter wounds from shrapnel may not, at least theoretically, damage the inner table so much, because there is lack of rotatory force which is imparted to a bullet by the rifled gun barrel. That force in bullet wounds is certainly transmitted, to some extent, to the inner table in expanding concentric waves and causes greater destruction of the inner table. Should not each helmet and scalp be searched for evidence of shrapnel or bullet injury and operative procedure be partly influenced on that ground, shrapnel gutters being of less importance, greater destruction, and more cortical damage, with inthrown bone fragments being anticipated in bullet wounds.

Penetrating Gunshots of the Head.—Let me show you the roentgenogram of another patient (Fig. 17). The bullet entered here in the parietal region and passed down and forward, coming to lie just behind the right orbit. You will note that it is reversed, that is, the point of the bullet now points exactly backward toward the wound of entrance. In other words, the bullet tumbled completely in its passage through the semiliquid brain mass. This finding is exactly in accordance with Horsley's experiments and it is an excellent example of bullet tumbling in the brain. You recall that his experiments were performed on skulls containing their brains and the wounds were filled with plaster of Paris, which took on the configuration of the wound track. In every penetration where the bullet remained in the skull it tumbles just *once*—no more. If the velocity is high enough we may expect a through-and-through wound, but in bullets which are partly spent and are destined to stop within the skull the tumbling occurs. It is correctly and easily explained by the fact that resistance of the lighter nose of the bullet tends to retard it and turn it down. The momentum of the heavier and bulkier body behind crowds it forward until it swings in a circle, and the heavier end finally comes around to lie in front as the missile travels on. For surgical pathology this has significance, because the track made by the bullet is not a simple penetration tunnel, but results in a broadened full-length-of-the-bullet-wide track. In this instance the tumbling was confirmed by digital examination of the track. The great shock of tumbling and transmitted rotatory force lends to the gravity of these wounds. Here, because of the tumbling of the missile in the semiliquid brain enclosed in its tight jar of skull, the immediate pathologic changes may not be limited to the track of the bullet, as shown in Bashford's findings in the examinations of solid organs, as kidney and liver, made at the 23d General Hospital last year. More remote circulatory changes must be induced by the conveyance of these movements.

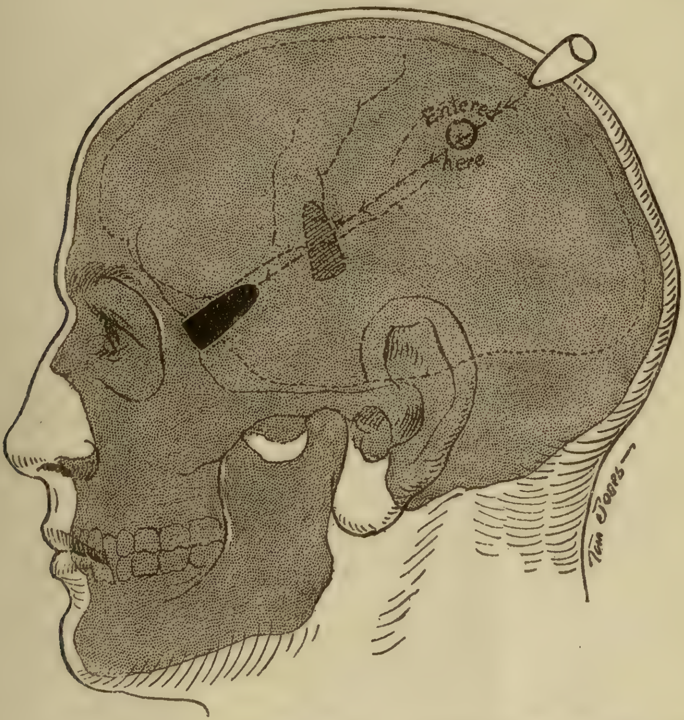

Fig. 17.—Penetrating bullet wound of brain. Entrance wound very small, caused by nose of bullet. Note reversion of bullet after tumbling in the brain.

Clinically, then, may we not conclude that these patients are in grave condition and should not be subjected to additional shock, as from operation, until they have partially recovered?

In penetrating shrapnel wounds the bone shower into the brain is relatively greater, but the total brain damage is not so great on account of the lack of rotatory motion.

Here are two patients representing mechanical pathology. This first one had a through-and-through wound from one temporal region to the other, rather high up. The skull was torn widely open; both hemispheres of the brain were deeply guttered; the longitudinal sinus was obliterated. The wound was cleaned, irrigated, bone fragments removed, and the trimmed scalp sutured over a drain of paraffin gauze. He is conscious, has no paralyses, but having seemingly recovered from his mechanical pathology received two days ago, we must now fear the bacteriologic pathology to follow. The prognosis is bad. (Patient passed away four days later.)

This second man exemplifies a similar type of mechanical pathology with a better prognosis. The missile entered here just behind the orbit, traversed the front of the skull, and made exit behind the other orbit, fracturing the ethmoid, nasal, and frontal bones, and opening the base of the frontal fossa into which I could pass my finger. The brain itself was evidently not lacerated, but I had to remove every trace of ocular tissue, all damaged, so that he is blind forever. He too has recovered from his mechanical pathology; we now may fear bacteriologic pathology from infection carried through or from contamination from opened nares and orbits. But he is draining away well by both nares and orbits. (He was sent to the Base two weeks later with normal temperature and every promise of recovery.)

Foreign Bodies Within the Brain—Removal.—As a rule may we not say that foreign bodies should be removed if anatomically accessible? Many small or deep-lying bodies do not demand removal. This third patient has had a gunshot fracture just behind the right ear with penetration of a sizable fragment of shrapnel and with a shower of bone. After trimming scalp and bone over a considerable area the index-finger could just palpate the shrapnel lying in the occipital lobe, about 5 inches deep. It was situated just in front of the torcular and below the straight sinus, which my finger could not find to be torn, both sinuses being palpated. The foreign body was removed and the scalp closed by a plastic operation. That was a month ago. We may now partly dismiss the fear of bacteriologic pathology, but not completely, because I have seen these patients go on for ten or twelve weeks and then die of a slowly progressing meningitis, especially if hernia cerebri is present. He has no hernia, although the scalp has partly sloughed away over the bony defect. No paralyses are present, nor visual disturbance, but his mentality is still weak. (He left for the Base in good condition six weeks after injury.)

Patients do recover from gas infections of the brain—I observed one last year.

Judged from the standpoint of retention or thorough removal, the question arises as to the relative irritation of intracranial bone and metal fragments. Major Cushing referred to this point last week in speaking of the brain's tolerance of foreign bodies. He considered that bone fragments caused more irritation intracranially than metal, because the latter were of themselves slightly antiseptic. On theoretic grounds—and clinical observation favors the conclusion—it seems to me that the well-vascularized brain might be supposed to absorb in recovery small bone fragments deprived of their normal blood-supply, just as bone transplanted and finding no physiologic functional demand is absorbed elsewhere in the human body. Probably both metal and bone are fairly negligible as bacteria carriers—rather must we consider the dirty scalp, hair, cloth, and other substances carried in, *usually on the metal.* Hence we say, "get the metal." All these bodies require irrigation and removal if possible. Metal from shells is sterilized by the heat of fire; human skull bone is reasonably sterile, but the contamination comes from the external human tissues and clothing.

CLINIC OF DR. THOMAS J. WATKINS

St. Luke's Hospital

RADIUM IN GYNECOLOGY—RESULTS WHICH MAKE IT WORTH WHILE

Summary: Presentation of 4 patients treated by radium. Case I. Fibroid tumor. Case II. Chronic metritis. Case III. Submucous uterine fibroid with cancer. Case IV. Inoperable cancer of body of uterus; effects of radium treatment on hemorrhage—its great value as a palliative measure in advanced carcinoma, even though a cure may be unhoped for.

These cases present different features and show the different effects from radium. In two the results were most gratifying, in the third they were disappointing, while in the fourth they were of distinct benefit.

Case I.—Mrs. D., aged forty, married twelve years, has an especially interesting history. A fibroid tumor was detected with her first pregnancy, which took place soon after marriage. The uterus was emptied, as it seemed inadvisable to permit the pregnancy to continue. A second pregnancy occurred, and the uterus was again emptied. Following this operation I did a vaginal myomectomy and removed sixteen fibroid tumors. She has since had two normal labors.

On August 25, 1917, she consulted me for hemorrhage, and examination revealed multiple fibroid tumors which made the uterus about the size of a three months' pregnancy. On August 30th 50 mg. of radium with 1 mm. of brass screening covered by rubber were inserted into the uterine cavity. She had very little constitutional disturbance from the radium. Twenty-six days after the radium insertion a menstruation occurred, which lasted three days and was about 50 per cent. normal in amount. Twenty-eight days later another menstruation occurred which lasted six days, normal in amount.

She was examined November 9th. The uterus was normal in size and I was unable to palpate any tumor. She had skipped the last two periods. It is not uncommon for one menstrual period to follow the use of radium, but it is unusual to have two periods before cessation of menstruation. This emphasizes the importance of waiting a considerable time before using a second treatment, which will generally be unnecessary. The fact that she had two menstruations would be evidence that the radium produced a marked effect upon the endometrium. The effect upon the ovary we would expect to occur earlier.

This is the first case I have ever seen where a fibroid tumor entirely disappeared or disappeared beyond ability to palpate from any treatment save operation. This patient was one that was very favorable for radium treatment, as the tumor was not large and as the patient was near the age of the menopause, and there were no suspicions of any intra-abdominal complications.

CASE II.—Mrs. S., aged forty-five, referred to me by Dr. G. M. Glazer. She had suffered from uterine hemorrhage for six months and between the periods had a profuse and often bloody discharge, and was obliged to wear a napkin continually.

Examination revealed a mucous polyp at the cervix and a uterus twice as large as normal. The size of the uterus was easily determined as conditions were very favorable for bimanual palpation.

Radium (50 mg.), screened as in Case I, was inserted on November 13, 1916, and left in twenty-five hours. A preliminary curettage was made to exclude the possibility of malignancy.

December 21, 1916, she reported that she had had two menstrual periods, the first one very severe and the second one moderate in amount.

February 17, 1917: No bleeding since December 14, 1916. The uterus considerably smaller than when radium was used.

November 15, 1917, she reported that since the radium was used she menstruated twice, and then menstruation ceased for eight months. The last two periods have come at the regular time and were normal in amount.

Examination showed a uterus that was possibly some smaller than normal for a multipara of her age.

The interesting features in this case are:

1. Two periods following radium insertion.
2. No menstruation for eight months.
3. Regular menstruation following.
4. The hyperplastic uterus has become normal in size.

This case indicates that the action of the radium was probably more pronounced upon the uterine tissue than upon the ovary.

Case III.—Mrs. B., aged seventy-two, referred by Dr. Archibald Church, consulted me May 5, 1917. She was usually well until one week ago, when she had a profuse uterine hemorrhage which has continued. Has some colicky pains in the pelvis. Menopause occurred at fifty-two.

Examination revealed a polyp about 3 inches in diameter presenting at the cervix.

On May 8th, under gas anesthesia, an examination was made, and the polyp was found to be very friable and attached by a small pedicle near the fundus. The mass was so friable as to be easily removed by clamping the pedicle with an 8-inch forceps, which cut through the pedicle. The rest of the uterus was entirely free of disease as far as could be determined by touch. Frozen section showed a cancer.

Radium (50 mg.) was left in the uterus for twenty-four hours. There were no constitutional symptoms from the radium.

On July 25th examination revealed a small nodule at the vault of the vagina. On the 28th, 50 mg. of radium were inserted in the vault of the vagina. Following this treatment she had severe bladder and rectal pains which lasted for two or three weeks, undoubtedly due to the radium. She passed a large amount of mucus from the rectum and considerable mucus and pus from the bladder.

August 28th examination showed no signs of recurrence. The vaginal vault was closed by adhesions. Rectal examination showed a very small uterus.

September 13th: The vaginal vault remains closed. There is a small nodule in the cervix and a small nodule in the left iliac glands.

October 12th: Both growths have enlarged.

November 10th: The growths in the cervix and iliac glands are enlarged so that they make one globular mass 3 or 4 inches in diameter.

This case has some interesting features. The prognosis seemed to be excellent with the radium on account of the age of the patient and the apparent limitation of the disease to the polyp. The rectal and bladder symptoms were probably due to insufficient screening. The case is interesting also as, notwithstanding the rapid growth of the tumor, there has been no recurrence of the bleeding, discharge, or odor, and the superficial wound has remained healed. The radium acted satisfactorily superficially, but did not destroy the deep growth.

Case IV.—This case is presented because positive results have been obtained and because it shows the great power of radium in extensive cancers. The history is as follows:

April 17, 1917: Mrs. D., aged forty-seven. Weighs 100 pounds. One year ago weighed 198 pounds; loss in weight apparently due to cancer. Family history is negative. Previous health good.

Present Illness.—Dates back six months, when constitutional and local symptoms commenced. For three months constant pelvic pain has been present, which probably means peritoneal involvement. She has taken *x*-ray treatments, which she thinks have not given her any relief or benefit. She says that she has become so much weakened that she cannot stand alone and has frequent fainting spells.

Menstruations were normal until about January, since when she has bled most of the time. She has had four pregnancies, the last in 1895. She has an offensive vaginal discharge which is constantly bloody. She also has increased frequency of urination.

Examination by Dr. Watkins, April 17, 1917.—*Abdominal.*—Increased tenderness over lower part of abdomen. Kidney impulse obtained on both sides and both are apparently normal.

Stomach resonance on percussion normal. Moderate general abdominal distention. No free fluid in abdomen. The growth in the median line extends up 3 or 4 inches above the pubes.

Vaginal Examination.—Vaginal portion of cervix short and transverse diameter about twice normal. The cervical canal is patent and is about ½ inch in diameter. The cervix is indurated, but not ulcerated. The anteroposterior size of the uterus is from the pubes to the sacrum. The growth extends to the bony wall on the right and extends less to the left. The uterine appendages are not palpable. Conjoined palpation gives an impulse over the uterus for 4 inches above the pubes. There is general increased pelvic tenderness. The vaginal discharge is purulent, watery, and offensive.

The diagnosis is cancer of the uterus, involving the pelvic peritoneum, the right broad ligament, and bladder wall. The carcinoma probably started in the body and has extended somewhat into the cervix. The extensive involvement of the disease makes the case inoperable.

Treatment Proposed.—There seems to be no hope of cure. We propose to use radium as a palliative measure. We are very firmly convinced that the palliative treatment of cancer is highly important and has been much neglected in such cases. The desperate condition of the patient is a strong appeal for service. It is a mistake, we believe, to take all hope of life away from her, as she has lost nearly everything else. The palliative treatment is also valuable in such cases to relieve the sorrow and anxiety of the relatives.

USE OF RADIUM

April 19, 1917: 50 mg. of radium put into uterus and left for twenty-four hours. Screened with glass, silver, brass, and rubber. No constitutional symptoms resulted from radium.

April 28, 1917: 50 mg. of radium, screened as before, in cervix and fixed by suture.

May 7, 1917: General condition unchanged.

May 10, 1917: Vaginal examination: Discharge about the same. Cervix smaller and more fibrous. Does not bleed upon examination. The patient seems weaker than when she was admitted.

May 17, 1917: 50 mg. of radium inserted into cavity of uterus.

May 29, 1917: Vaginal examination shows some adhesive vaginitis.

June 4, 1917: Vaginal discharge has entirely stopped. She has a fistula between bladder and uterine canal.

It seems inadvisable to give more notes from the record. The points of special interest in the further history of the case are as follows: 1. Cessation of all offensive discharge from this time until the patient died. 2. Absence of bleeding subsequent to a few days after the first insertion of radium. 3. Cervical wound remained healed. 4. The amount of pain was very much lessened and for weeks was controlled with one or two powders daily containing ½ grain of codein and 5 grains of aspirin. The patient died August 2d from general exhaustion.

Remarks.—It is difficult to estimate the value of the radium in a case like this. We believe the value of palliative treatment should be emphasized; that in the case of cancer the disease is often worse than death both to the patient and the relatives. The ability to stop hemorrhage, to stop the offensive discharge, and to lessen the pain can only be appreciated by those who have been intimately associated with the care of cancer cases.

The special interesting features as far as the radium was concerned were that the wound healed and remained healed until the time of her death, except for the uterovesical fistula, which persisted. The relation of the radium to the lessened pain is an interesting subject. The decrease in the amount of pain was, in all probability, largely due to the elimination of most of the infection, and consequently the lessening of the amount of round-celled infiltration, pressure, and septic neuritis.

CLINIC OF DR. DANIEL N. EISENDRATH

Michael Reese Hospital

VARIETIES OF URETERAL STRICTURES

Summary: A patient, septic and with a right lumbar pyo-urinary fistula following operation for supposed gall-bladder disease; demonstration of impermeable ureteral stricture; operation—removal of enormously dilated renal pelvis and infected hydronephrotic kidney; causes and types of ureteral strictures.

I wish to present today a young man, twenty-nine years of age, who entered the hospital yesterday with the following history: His present illness began eight years ago when he began to have chills and fever accompanied by pain in the right lumbar region and the appearance of a swelling in this location. All of these symptoms would disappear after the use of hot applications. During several of these attacks, which recurred at irregular intervals, he had been seen by physicians who had made a diagnosis of gall-bladder trouble. He had a sore on his penis nine months ago and has had three injections of salvarsan. He has also had four attacks of gonorrhea, but without any serious complications that he is aware of. Six weeks ago while in another city he had another attack of severe pain in the right upper quadrant of the abdomen. A diagnosis of acute cholecystitis was made and the abdomen opened by a transverse incision. The painful enlargement, which could be distinctly felt just below the right costal arch, proved to be a greatly distended kidney. This was sutured to the anterior abdominal wall at the posterior end of the incision and a drainage-tube inserted. Later examination by the surgeon showed an impermeable stricture of the right ureter in its upper third.

The patient, since admission to my service, has had a marked leukocytosis and a high temperature (105° F.); a turbid fluid constantly escapes from the posterior end of a transverse right-sided upper abdominal incision. The Wassermann reaction is negative. Radiographic examination of the urinary tract reveals no shadows of calculi. Upon cystoscopic examination the right ureteral orifice is seen to be quite prominent and red, but no urine is ejected from it. No. 5 ureteral catheter cannot be passed further upward into the right ureter than to a point corresponding to the junction of the middle and upper thirds. The stricture does not permit even of the passage of a filiform ureteral catheter. For this reason and on account of the fistula previously referred

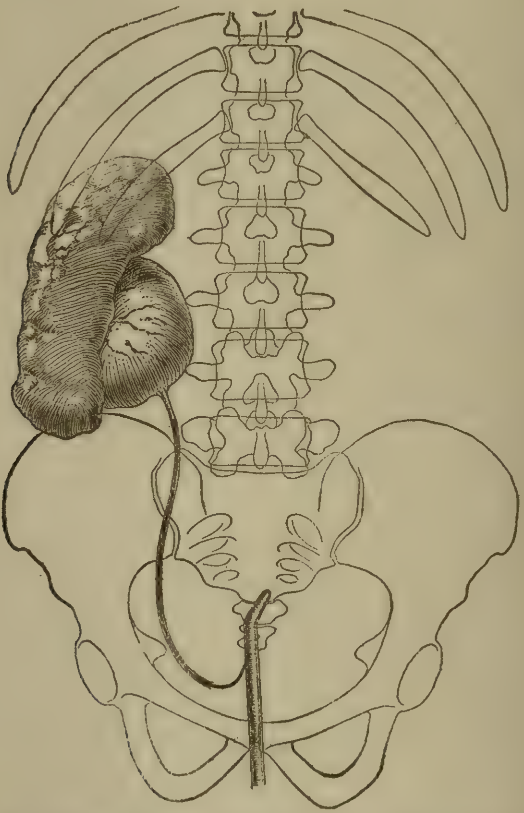

Fig. 18.—Hydronephrosis secondary to inflammatory stricture of the right ureter. Note *x*-ray catheter inserted to level of stricture in lumbar portion of ureter.

to, it is impossible to fill the ureter above the point of obstruction with fluids like thorium, collargol, or argentide, which we permit to flow by gravity through the ureter in order to obtain information in regard to the degree of dilatation of the ureter or renal pelvis. This is a method of diagnosis known as ureterography or pyelography, as the case may be. Although this method is condemned by some as being a very dangerous one, I feel that if we do not employ force to inject the fluid, but permit it to flow in by gravity, it is no more dangerous than a cystoscopy. We have inserted an *x*-ray catheter to the point of constriction and taken an *x*-ray picture of the entire urinary tract. This demonstrates that the stricture in the right ureter is located at the level of the upper border of the fifth lumbar vertebræ, *i. e.*, in the lumbar portion of the ureter close to a large shadow which is evidently the much distended renal pelvis and kidney (Fig. 18).

The functional test (phenolsulphonephthalein) and examination of the urine obtained by catheterization of the opposite kidney show that a nephrectomy of the right-sided infected hydronephrotic kidney would be a safe procedure. We shall now proceed to perform a right nephrectomy.

Comments During Operation and Examination of Removed Kidney.—The nephrectomy was a most difficult one owing to the extensive and firm perinephritic adhesions. It was only by employing the subcapsular method recently advocated by W. J. Mayo (Surgery, Gynecology, and Obstetrics, vol. xxiv, January, 1917) that the renal pedicle was isolated without tearing the vessels. There were no accessory arteries or veins to the upper or lower poles. The renal pelvis was tensely filled with fluid. This portion of the kidney was the size of an orange and was found in the iliac fossa. At its lower end the dilatation ended abruptly, as examination of the removed kidney (Fig. 19) will show. Just below this sudden decrease in size of the renal pelvis was a complete obliteration of the lumen at a point where the lumbar ureter had been converted into a fibrous cord for a distance of 1 inch. The kidney on section and upon its surface shows an advanced infection in the shape of multiple miliary abscesses and streaks of pyogenic infiltration. On account of this infection it will be necessary to provide for ample drainage before the wound is sutured.

After removal of the kidney, I have filled the kidney with a solution impervious to the *x*-ray, *i. e.*, we have made a pyelogram of the specimen and you can readily see the marked degree (Fig. 20) of the distention of the renal pelvis at the expense of the parenchyma.

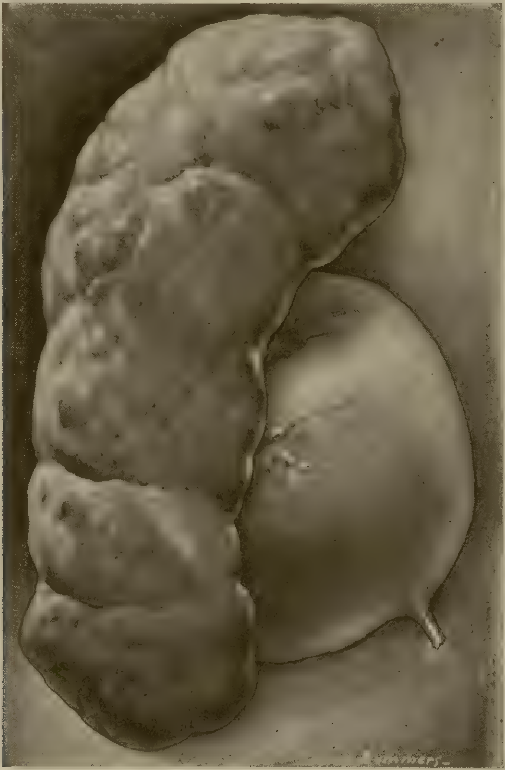

Fig. 19.—Hydronephrosis with greatly dilated renal pelvis secondary to a stricture of the ureter of inflammatory origin. Note how narrow the ureter is at point of stricture close to its junction with renal pelvis.

Postoperative Notes.—The patient made an uneventful recovery for first forty-eight hours, then began to hiccup at frequent intervals, and urine (from remaining kidney) showed traces of albumin and hyaline and granular casts. These threatening uremic symptoms yielded rapidly to treatment and patient was

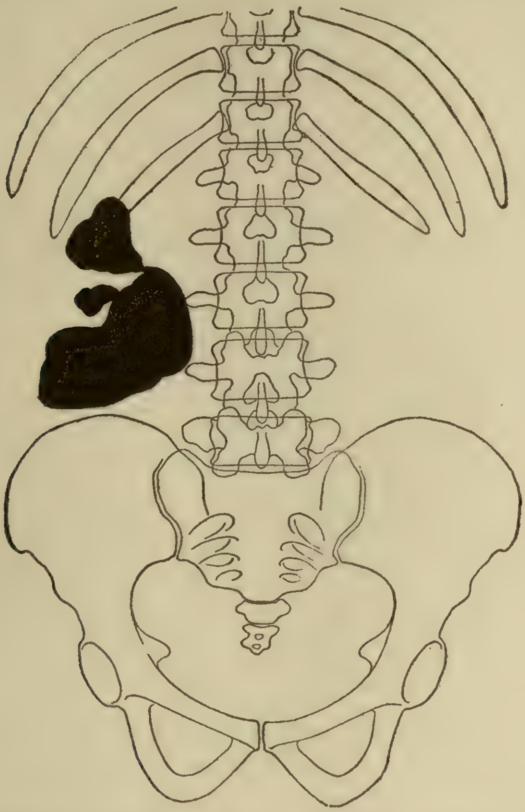

Fig. 20.—Pyelogram of hydronephrosis due to stricture in lumbar portion of the right ureter.

able to get up on the tenth day. The wound discharged for about three months, but remained healed after that time.

DISCUSSION OF ETIOLOGY OF STRICTURE IN ABOVE CASE AND OF STRICTURES OF THE URETER IN GENERAL

The most convenient division of strictures of the ureter from the standpoint of etiology is into congenital and acquired, as follows:

- Congenital
  1. Valve formation (Fig. 21).
  2. Actual narrowing—more or less complete (Figs. 22 and 23).
  3. Spiral twists (Fig. 21).

- Acquired
  - Extrinsic causes
    1. Compression by neoplasms.
    2. Accessory vessels to lower pole of kidney (Fig. 28).
    3. Trauma to peri-ureteral tissues.
  - Intrinsic causes
    1. Inflammatory (pyogenic).
    2. Secondary to tuberculosis of kidney (Fig. 27) or bladder.
    3. Secondary to impacted calculus (Figs. 25 and 26).
    4. Primary carcinoma of ureter.

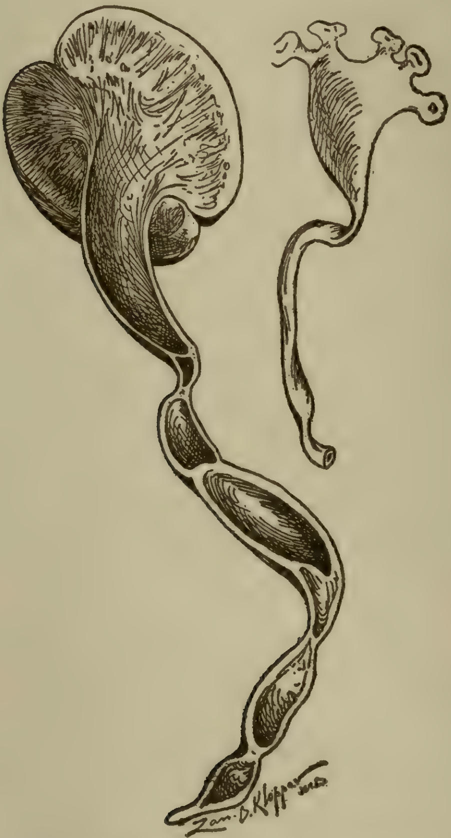

Fig. 21.—Sectional view of human ureter showing normal points of constriction, valves within lumen and spiral twists of the ureter (Byron Robinson).

Congenital Stenoses of Ureter.—Now let us first consider the congenital forms. These are held to be rather rare by some writers (Caulk, Hunner), but the contributions on this subject by Bottomley[1] and myself[2] demonstrate that they do not occur

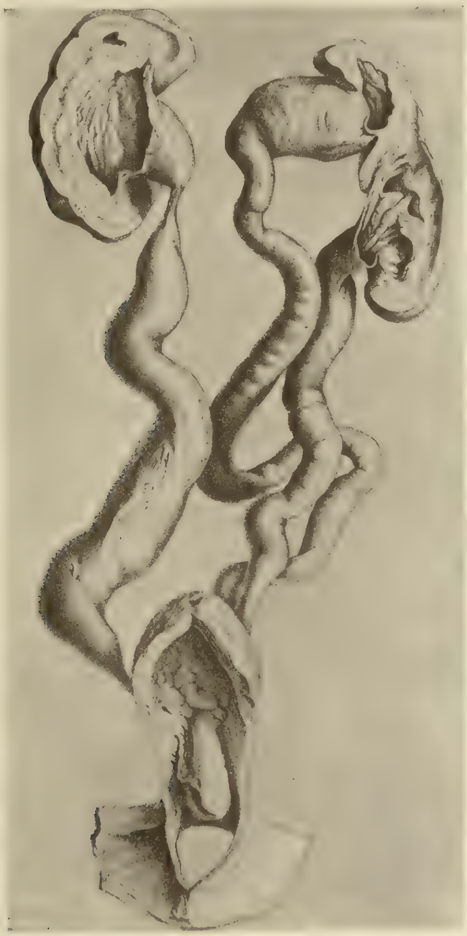

Fig. 22.—Single fetal ureter on one side shows points of stenosis just below kidney and above bladder with marked hydro-ureter between points of constriction. Note double ureters, both greatly dilated, as result of obliteration at lower end with protrusion into bladder (Boström).

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[1] Annals of Surgery, 1910, vol. lii, 597.

[2] Surg., Gyn., and Obst., 1911, vol. xiii, 533; Jour. Amer. Med. Assoc., 1911, vol. lvii, 120; Annals of Surg., May, 1917, vol. lxv, 553.

as infrequently as we have been led to believe. They seldom show any symptoms in early life, and in my last case the patient who had complete congenital obliteration of the ureter just above the bladder (Fig. 23) was fourteen years old when the first symptom appeared and was operated on at the age of twenty-eight. Congenital stenoses of the ureter are not always the result of obliteration of the lumen, but are frequently the result of a spiral twist in the course of the ureter or the persistence of fetal valves (Fig. 21). The congenital obstructions due to obliteration of the lumen may be permeable or impermeable, and are found in one or more of three locations, *i. e.*, just within or above

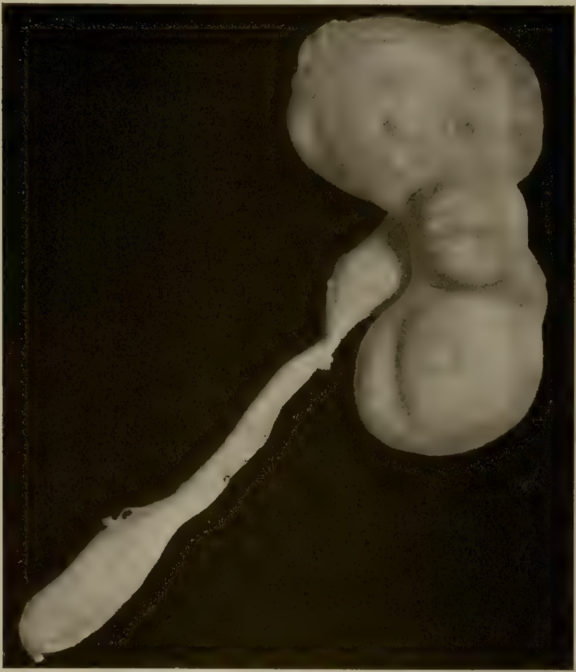

Fig. 23.—Photograph of hydronephrotic kidney and hydro-ureter from one of the author's cases of congenital stenosis of the ureter, occurring in a man of twenty-eight. Note complete obliteration of ureter at its lower end (just above bladder) and the enormously dilated ureter proximal to this impermeable stricture and slight narrowing just below renal pelvis.

the bladder, at the brim of the pelvis, or at the junction of the ureter and renal pelvis (Fig. 23).

There may be stenoses simultaneously present at two levels and marked dilatation of the ureter between the two. The ureter and kidney seldom attain such an enormous degree of dilatation in acquired (Fig. 23) as they do as the result of congenital stenoses of the ureter.

In the 5 cases reported by me in the article[1] referred to, the ages of the patients when the first symptoms appeared varied from seven to twenty-eight years. Up to the time of the publication of this article 67 cases had been recorded, including my 5 cases. The most important cases are those in which the vesical end of the ureter is closed so that the greatly dilated lower end of the ureter protrudes into the lumen of the bladder, the protrusion varying in size from that of a small pea to one which fills the entire interior of the bladder. A survey of all of the published cases of congenital stenosis of the ureter shows that clinically they belong to four classes:

(1) Those in which the condition remains latent throughout life and is an accidental finding at autopsy (Fig. 22). The majority of the published cases belong to this class. (2) Those in which an abdominal tumor, usually an enormously distended ureter or kidney, or both (Fig. 23), is found clinically. (3) Cases with acute onset of symptoms of renal infection, the operation disclosing the underlying condition. (4) Those in which disturbances in micturition are the principal symptoms, usually cases of intravesical protrusion of a closed lower end of the ureter (Fig. 22).

Acquired Strictures.—*Inflammatory.*—Kelly and, later, Hunner[2] have called attention to an important clinical group ot cases of strictures of the ureter in women. Hunner believes that they are usually due to metastatic infection of the wall of the ureter, the primary disease being in the teeth, tonsils, etc. In 12 of his 50 cases the condition was present on both sides.

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[1] Annals of Surgery, vol. lxiv, May, 1917.

[2] New York Med. Jour., vol. civ, July, 1916, and Johns Hopkins Hospital Bulletin, 1918, xxix, 1.

The clinical picture under which this form of stricture of the ureter appears is not unlike that of the congenital variety, viz., (*a*) as hydronephrosis; (*b*) intermittent attacks of renal colic; (*c*) as pyelitis resistant to pelvic lavage. Of his 50 cases, 2 were of gonorrheal origin, 3 due to cystitis, and the remainder metastatic. The stricture was within 6 cm. of the bladder in 53 cases, near the pelvic brim in 8, and near the kidney in 1 case.

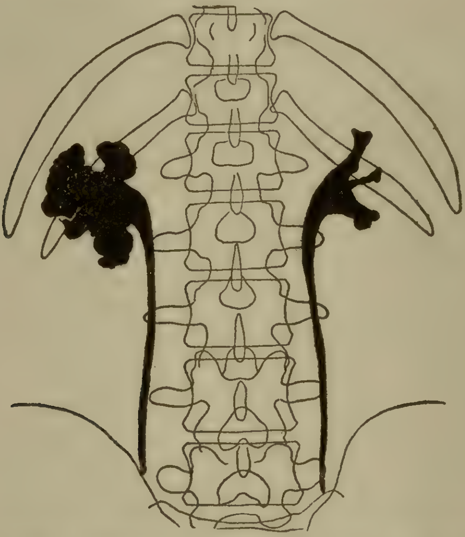

Fig. 24.—Tracing of pyelogram from author's case of right-sided traumatic stricture of the lumbar portion of the ureter with secondary dilatation of renal pelvis. Compare large irregular shadow of hydronephrotic kidney with normal shadow of opposite side.

Strictures of syphilitic origin have, so far as I know, never been described, but there is no reason why they should not exist here as in other hollow viscera.

Strictures Due to Injury and to Impacted Calculi.—Although laceration of the ureter as the result of blows or other forms of non-penetrating injury do not occur frequently, one must not overlook such a possibility. In the patient whose pyelogram is shown in Fig. 24 a blow over the right kidney region was followed a few weeks later by attacks of colicky pains radiating downward along the right ureter. Upon attempting to insert a catheter into the right ureter, obstruction was encountered in its lumbar portion and a pyelogram revealed a moderate degree of hydronephrosis (Fig. 24).

A most instructive example of how a calculus impacted in the ureter can cause a decubital ulceration of the mucosa with resultant stricture formation and hydronephrosis is shown by the case from which this specimen was obtained (Fig. 26). This patient was a girl of twenty who had suffered from attacks of ureteral colic for a number of years. *x*-Ray examination showed a tooth-shaped calculus in the pelvic portion of the right ureter (Fig. 25). After removal of this calculus a urinary fistula persisted. There was complete obliteration of the ureteral lumen at the point where the calculus had been lodged. On account of the presence of an infection of the kidney a removal of this organ was necessary, and revealed the fact that back-pressure upon the kidney with marked dilatation of the renal pelvis and calyces accompanied by infection had existed for some time.

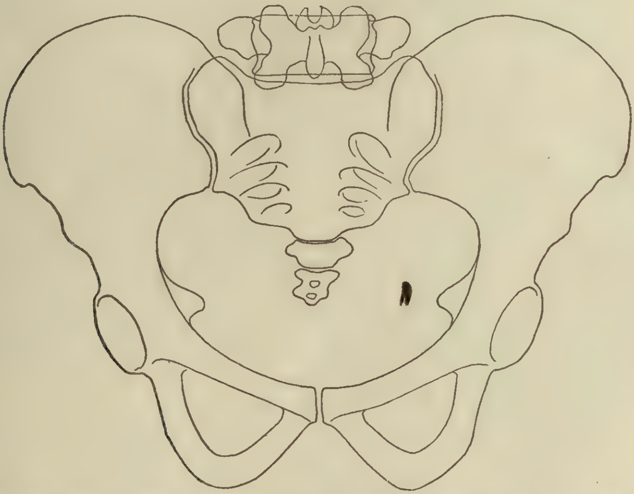

Fig. 25.—*x*-Ray tracing of calculus impacted in pelvic ureter complicated by advanced infected hydronephrosis and stricture of ureter at point of impaction (author's case).

Other causes of acquired stricture of the ureter are tuberculosis and carcinoma. The former may cause occlusion of the lumen at a comparatively early period or not until a late stage of the process. I have observed such strictures due to tuberculous ulceration with secondary cicatrization at all levels. If it occurs near the bladder, the ureter and renal pelvis (Fig. 27) become very much dilated. If the stricture is at the junction of the ureter and renal pelvis an enormous hydronephrosis may result, the tuberculous origin of which is often difficult to demonstrate. Neoplasms, especially those having their origin in the structures of the true pelvis (uterus, bladder, etc.), may cause compression of the ureter with symptoms like those of true in-

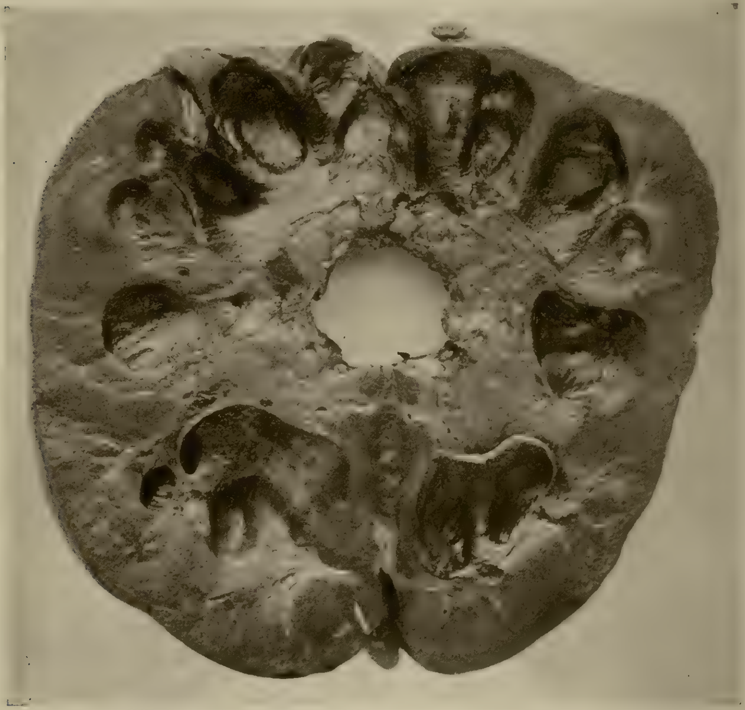

Fig. 26.—Hydronephrotic kidney from case of stricture of the ureter due to calculus impacted in pelvic portion of ureter. Note dark color of mucous lining of the moderately dilated calyces of renal pelvis showing marked infection.

trinsic strictures of the ureter. A primary carcinoma of the ureter is comparatively rare, but a sufficiently large number of cases have been reported to justify such an origin in the differential diagnosis of ureteral strictures.

Other but rarer causes of stricture of the ureter of an inflammatory nature are those following gonorrheal infections of the ureter, of which several cases have been reported, and again strictures of the ureter due to extension of the infection from a peri-ureteritis complicating pelvic infections in the female.

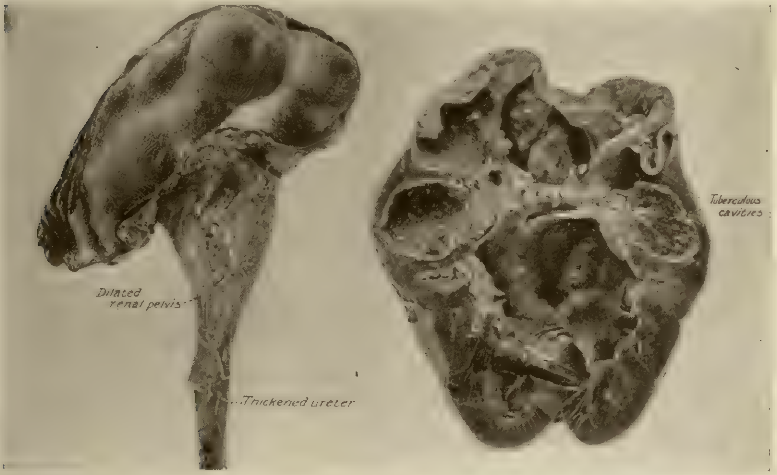

Fig. 27.—External appearance (on left) and sectional view (on right) of typical example of dilatation of the ureter and renal pelvis secondary to a tuberculous stricture of the ureter in a case of tuberculosis of the kidney.

Rarer causes of stricture are those due to inclusion of the ureter in ligatures applied during hysterectomy and temporary inclusion of the ureter in the bite of the artery forceps during similar operations.

Stenosis of the Ureter Due to Compression of the Lumen by Accessory Vessels at the Lower Pole of the Kidney.—Attention was first directed to this subject by an article of Ekehorn's (Arch. f. klin. Chir., 1907, 82, 955), but the clinical importance of such an anomaly was not appreciated until W. J. Mayo (Jour. Amer. Med. Assoc., 1909, 62, 1383) reported a number of cases which he had observed. The accessory artery in all but 2 of the 20 cases came directly from the aorta, and at times was behind and in others in front of the ureter, but in either of these positions the pressure of the artery on the ureter or the adhesions between the vessels and the renal pelvis were capable of developing a kink. Ekehorn in his series of 25 cases of hydronephrosis found the accessory vessels anterior to the ureter in 64 per cent. and posterior in 28 per cent. If those vessels are posterior, the ureter is kinked at the point of stenosis, while if they are anterior, it is compressed.

I desire to show you here a specimen (Fig. 28) from a most typical case of the variety where the accessory vessels lying anterior to the ureter caused compression with the development of a secondary hydronephrosis. The patient was a boy of nineteen. He was first seen on November 13, 1916. He gave a history of having been perfectly well up to the time when he received a kick in the left lumbar region while playing football two years before (1914). Since that time he had recurrences of colicky pains radiating down the ureter once a month, lasting one to two days. For a period of six months prior to my first examination these attacks had recurred about twice a week. There were no disturbances in urination during the attacks. The pain was especially marked over the region representing the anterior portion of the abdomen. The past history was negative.

A careful examination was made of the urinary tract at that time with negative results, the only finding being that the left ureteral orifice was slightly more prominent than the right, and was edematous.

He was seen a second time in March, 1917. In the interval the patient had had several attacks of pain in the opposite (right) lumbar region, radiating along the right ureter. The left ureteral orifice showed less edema and redness than that of the right side.

He was re-admitted on May 17, 1917. At that time the symptoms were more marked over the left kidney, there being a distinct tenderness in the left iliocostal space. Roentgenograms of the urinary tract failed to show any abnormal shadows. Cystoscopy revealed a slightly edematous and reddened left ureteral orifice and a normal right one. A ureterogram revealed the presence of a distinct kink in the left ureter opposite the transverse process of the fourth lumbar vertebra, with a dilatation of the ureter above that point, and a moderate degree of dilatation of the renal pelvis itself.

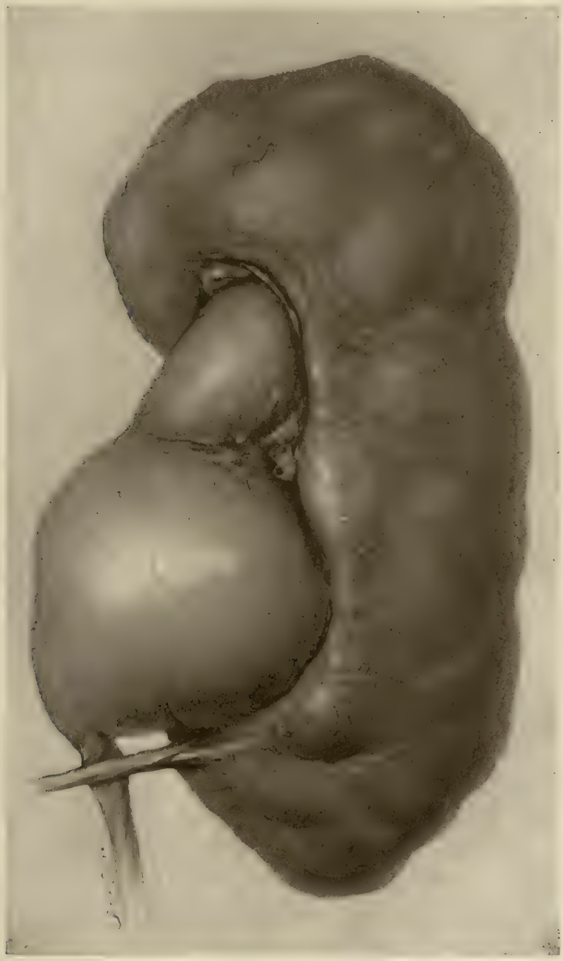

Fig. 28.—Obstruction of ureter due to accessory artery and vein to lower pole of kidney (author's case).

At operation during this stay in the hospital we found that the left kidney was greatly enlarged and tensely distended with fluid. On the surface of the kidney were a number of scattered miliary abscesses. The size of the kidney was in a great measure due to the enormous enlargement of a tensely filled pelvis. This enlargement ended abruptly at the point where the ureter began, and this sudden change in caliber was due to an almost complete obliteration or compression of the lumen of the ureter by an aberrant artery and vein, each about the size of a darning needle, which passed directly from the aorta to the lower pole of the kidney (Fig. 28). As soon as these were divided, after being ligated, fluid was immediately seen to pass from the tensely distended pelvis into the ureter past the former point of constriction. The main renal vessels entered the middle of the hilum of the kidney. On account of the extensive infection present it was deemed advisable to perform nephrectomy.

The patient made an uneventful recovery. The kidney on section showed the typical picture of an infected hydronephrosis with only a narrow rim of the parenchyma left.

The latency of the symptoms up to the age of sixteen can only be explained by the fact that not until the trauma had caused some disturbed renal conditions, that is, the congestion of the ureter at the point of constriction, did the symptoms of obstruction appear, and these only became more manifest when the infection set in.

DIAGNOSIS AND TREATMENT OF URETERAL STRICTURES

The clinical pictures under which ureteral strictures appear are, as a rule, as follows:

1. Recurrent attacks of colicky pain simulating appendicitis, ureteral calculi, and kinking of the ureter due to movable kidney. In every doubtful case of appendicitis one should never neglect a thorough examination of the urinary tract as a routine procedure before operation is done.

2. The appearance of a tumor in the kidney region may be the first sign of the presence of a stricture or obstruction of the ureter.

3. Evidences of renal infection (chills, fever, etc.), with or without previous symptoms, like tumor or ureteral colic, may be the predominant features of the case.

4. Unusually severe reactions from ureteral catheterization, either in the form of pain or symptoms of infection, are recorded by Hunner as of great importance in leading one to suspect the presence of ureteral stricture.

Instrumental examination, that is, the introduction of bougies of different calibers, supplemented by ureteral pyelography, is the only accurate method of making a diagnosis of ureteral stricture when a renal tumor is not present. In passing the ureteral bougies or catheters in suspected cases one must not overlook the fact that the instrument may catch in the folds of mucous membrane, and in the inexperienced hand lead to the diagnosis of true ureteral obstruction. For the purpose of determining the caliber of the stricture the use of a set of bougies such as those shown in Fig. 29 is necessary. These are easier to insert, as a rule, in the female than in the male. Garceau's tapering catheter is also of great value in the diagnosis and treatment of such strictures. If the presence of infection contraindicates the use of the dilating bougies or the stricture is of an impermeable character, operative procedures must be considered.

For strictures at the upper portions of the ureter a form of plastic operation after the manner of performing pyeloplasty by the Heineke method has been successful in a number of cases. End-to-end anastomosis and similar methods of ureteral anastomosis have never been successful in the human being on account of the infection present, as well as the tendency to stricture formation at the point of anastomosis.

At the lower end of the ureter if dilatation is unsuccessful one must consider the advisability of dividing the ureter above the point of stenosis, and reimplanting it into the bladder by one of the generally accepted methods of performing this operation.

In cases of impermeable stricture and in those accompanied by a considerable degree of hydronephrosis, as in the case just reported, nephrectomy, with removal of the ureter down to the point of stricture, is the only method of procedure.

Operative treatment of congenital strictures does not differ from that of the acquired variety except that the question of

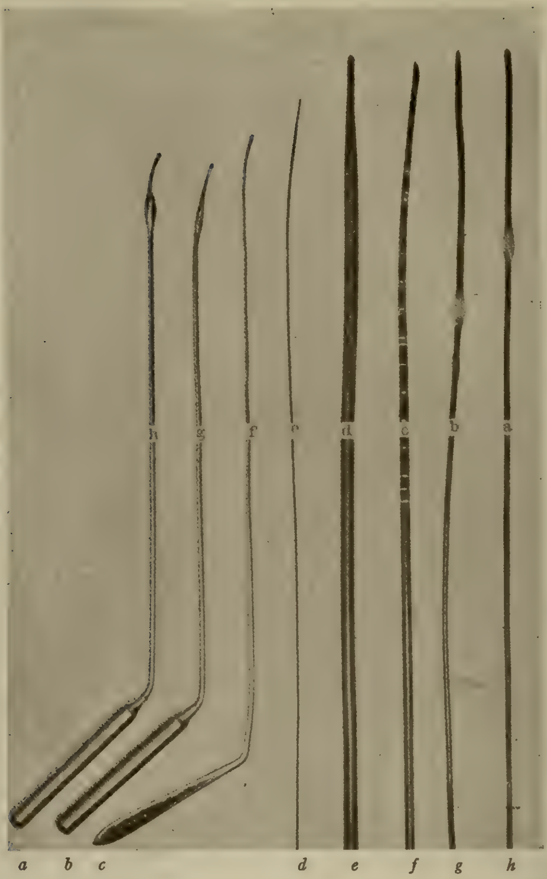

Fig. 29.—Set of ureteral catheters, etc., used by Dr. Guy L. Hunner: *a*, Blunt round tip renal catheter with wax bulb; *b*, olive tip renal catheter with large wax bulb protected on either side with smaller bulb; *c*, Garceau graduated whistle tip catheter; *d*, flexible bougie (7 mm. diameter)—sizes vary from 3 to 10 mm., the smaller sizes being useful for dilating through the cystoscope from below, and the larger sizes for retrograde dilatation from above; *e*, whalebone filiform—varying sizes are used through the cystoscope; *f*, metal searcher with olive tip; *g*, metal bulb dilator (3 mm.) with curved olive tip; *h*, metal bulb dilator (5 mm.) with curved olive tip.

operative procedure is much more difficult to solve on account of the enormous dilatation, with the resulting thinning of the walls of the ureter above the point of stenosis.

CLINIC OF DR. ROGER T. VAUGHAN

Cook County Hospital

ACUTELY STRANGULATED INTRA-ABDOMINAL TUMORS

Summary: Case I. Large ovarian cyst; acute torsion of pedicle with hemorrhage into cyst and into the peritoneal cavity; removal of cyst by laparotomy. Case II. Tubo-ovarian cyst with twisted pedicle; removal of cyst by laparotomy; discussion of pathology, symptomatology, diagnosis, and treatment of acutely strangulated intra-abdominal tumors.

CASE I

History.—The patient is a married woman, aged forty-eight; nationality Irish; occupation is chiefly housework.

Three days ago, on Monday, June 11, 1817, on getting out of bed in the morning she felt a sudden sharp pain in the right lower quadrant of the abdomen. It was cramp-like, or, as she describes it, "like a labor pain." The pain was followed immediately by vomiting and a feeling of extreme weakness. Soon thereafter the patient says she fainted, but the "faint" lasted only a few minutes and she was not completely unconscious, she thinks. The pain and prostration were so severe that the patient went back to bed and remained there all day, the pain still being confined to the right lower quadrant, but not increasing in severity.

The next morning, Tuesday, while still in bed the patient had a sudden and even more severe recurrence. This, too, was right lower quadrant pain. She actually fainted this time and remained unconscious for some minutes. The prostration was very severe. A doctor was called, who took her temperature and reported it to be 102° F. He said that her trouble amounted to nothing, that she was merely pregnant!

The pain continued throughout the day and night, and the patient, who did not believe herself pregnant, but thought she had some serious trouble, had another doctor called, who made a diagnosis of abdominal tumor and advised her to go to the hospital for operative removal. She was afraid of the knife then and declined, but today, the pain and vomiting continuing unabated as on the three previous days, she consented and was brought here.

She has been quite thirsty ever since the onset of the pain on Monday. While in bed she has been restless. Her folks noticed on Tuesday that she looked pale and they thought her face swollen. She noticed no dimness of vision, no shortness of breath, and no jaundice. Her bowels did not move Monday, Tuesday, or Wednesday, but they moved spontaneously this morning (Thursday) in moderate quantity.

Her last menstrual period was May 20th. The flow was not quite so profuse as usual. There has been no bloody vaginal discharge at all since then. Her next preceding period was about April 20th, and was of usual duration. She does not believe herself pregnant. Her flow is usually from two to three days, but the periods between flow vary sometimes from the twenty-eight-day type. She has been married twenty-two years and has had five normal full-term deliveries and one miscarriage at eight months. Last pregnancy was eight years ago.

She has had no previous illness except rheumatism.

Examination.—The patient's pallor is striking in so well nourished a woman. She is greatly prostrated, but not especially dyspneic. On entrance to the ward the following observations were recorded: Temperature 102° F., pulse 108, thin and thready, respirations 24.

Examination of the head, neck, and thorax is negative. The *abdomen* is rather distended. There is dulness on percussion in the right flank extending up as high as the umbilicus. Anteriorly and in the left flank there is tympany. There is some increased resistance to palpation in this area, but no mass can be definitely outlined. Peristaltic sounds are present. There is no peritoneal friction-rub audible.

Vaginal examination shows a little thin bloody discharge (the patient's menstrual period is just about due). No particular change in color of the vaginal mucosa. The uterus lies rather high, but can be moved in every direction, though not quite so freely, perhaps, as normally. The right fornix seems to show a little more resistance than the left, but no mass is palpable. There is no tenderness on vaginal examination.

Blood-pressure: Systolic 122, diastolic 84. Blood examination: White cells 17,000; red cells 2,370,000; hemoglobin 50 per cent. Urine examination is negative, no albumin or casts.

Comments.—Dr. Hallock, who is on the examining room service and admitted the patient to the hospital, made a diagnosis of ovarian cyst with a twisted pedicle. The intern who wrote the history thought a ruptured ectopic pregnancy more likely in view of the bloody show found on vaginal examination and the low red count and low hemoglobin percentage. Both interns recognized at once the urgent nature of the case and the necessity for immediate laparotomy. I cannot understand how the patient's family physician could have overlooked the urgent nature of the case and assured her that she merely had the vomiting of pregnancy. The consultant whom she called recognized the surgical nature of the case and is not in any way responsible for the delay in getting her to the hospital.

We must now operate on a woman with only 50 per cent. hemoglobin, who has been in more or less shock for three days. She is nearly fifty years of age. Had she been brought here at once after acute abdominal pain, prostration, and vomiting, showing a surgical abdominal emergency, her chances for recovery would have been materially improved. The blame for this delay is partly the patient's and partly the fault of the family doctor whose incomplete examination or lack of surgical acumen failed to discover the patient's danger. Consequently, he failed to urge on her the immediate action so necessary in her case.

I am rather surprised that after seeing so many doctors the patient has not had a diagnosis of acute appendicitis made. That is so frequently the error in cases of right-sided twisted ovarian cysts or ruptured right ectopic pregnancy. Appendicitis, however, can be ruled out easily here. There was no diffuse abdominal pain at the onset. The pain was located in the right lower quadrant from the start and has remained there all the time. Its onset was sudden. So excruciating was it that the patient twice fainted from the suffering. The pain at the onset of appendicitis is, as a rule, not so severe that the patient goes into shock and faints, whereas with an acutely twisted ovarian cyst collapse or fainting is the rule. Furthermore, there was no fever with the onset, although the temperature was taken on the second day of illness by the doctor. Fever of 102° F. has now developed after three days of illness.

Ileus is not present. Her bowels moved well this morning after three days of constipation. Vomiting is no more frequent today than it was at the onset.

The intern in his history has well brought out the development of the illness day by day. This history in connection with the examination makes me think that we have to deal here with a twisted ovarian cyst rather than a ruptured ectopic pregnancy. The bloody vaginal show plus the diminution in the amount and duration of the last flow are somewhat suggestive of ectopic pregnancy, especially in connection with the blood findings, but one must not overlook the fact that *an acutely twisted ovarian cyst usually has considerable hemorrhage into its wall and lumen*, and that this hemorrhage may even result in rupture of the cyst and hemorrhage into the free peritoneal cavity. Such a peritoneal hemorrhage may be as copious as the rupture of an ectopic pregnancy and may likewise result fatally.

In *my* examination in the ward I found dulness and a sense of resistance on the left side, whereas the intern noted it on the right. When I first saw the patient I found her lying on the left side and had to turn her back into a recumbent position. The fact that the mass and the dulness at one time are on the right and at another on the left side would speak for a movable tumor. Why have we not been able to outline a tumor definitely if it is present and producing dulness and a sense of resistance? Probably because it is not tensely filled, though the amount of internal hemorrhage she seems to have had would make us think that it should be tense at least with blood. Tenseness might also be lacking in a cyst if ruptured or surrounded by adhesions. I do not believe this cyst can be surrounded by adhesions because it seems too freely movable. However, these details are not essentials, but the diagnostic niceties of the case. The important fact to recognize is that this case is an urgent surgical emergency and that immediate laparotomy is necessary. All further details of diagnosis can be completed at operation; but this one essential conclusion must be arrived at first.

Operation (*Ether Anesthesia*).—On palpating the patient's abdomen (just before making the initial incision) an ill-defined mass can be made out filling most of the right half of the abdomen, though not reaching quite to the umbilicus anteriorly. The patient's muscular resistance being eliminated by anesthesia enables us to palpate much more accurately than in the ward.

(Midline incision below the umbilicus.)

On opening the peritoneal cavity blood at once flows out, rather thin in consistency, and with a slight tendency to be stringy. With the hand introduced into the abdomen I find a large cyst filling the right flank. It is without tenseness. A marked twist in the pedicle of the cyst can be felt at the right cornu of the uterus. *No clots* appear to be present in the abdominal cavity (always present in ectopic pregnancy). The cyst is so relaxed that it is readily brought out through the hypogastric incision without preliminary puncture. It seems to be twisted on the uterus practically a full turn, 360 degrees, in counterclockwise direction, left to right, supposing the clock to be facing the uterus. The twisting in this case thus follows Küstner's rule. The wall of the cyst and its pedicle are suffused with blood, as is also the right fallopian tube which lies along the surface of the cyst. The fimbriated end of the fallopian tube is filled with a large mass of clots, which suggest that the peritoneal hemorrhage may have come from the tube rather than from the cyst (Figs. 30, 31).

When the cyst was fully delivered from the abdominal cavity no bleeding point or leak could be found in it. The pedicle and tube were clamped off close to the uterus and a continuous suture of catgut applied to the stump, over which the peritoneum was then drawn. Primary closure of the operation wound was carried out without any attempt to wipe the abdominal cavity thoroughly clean of bloody fluid.

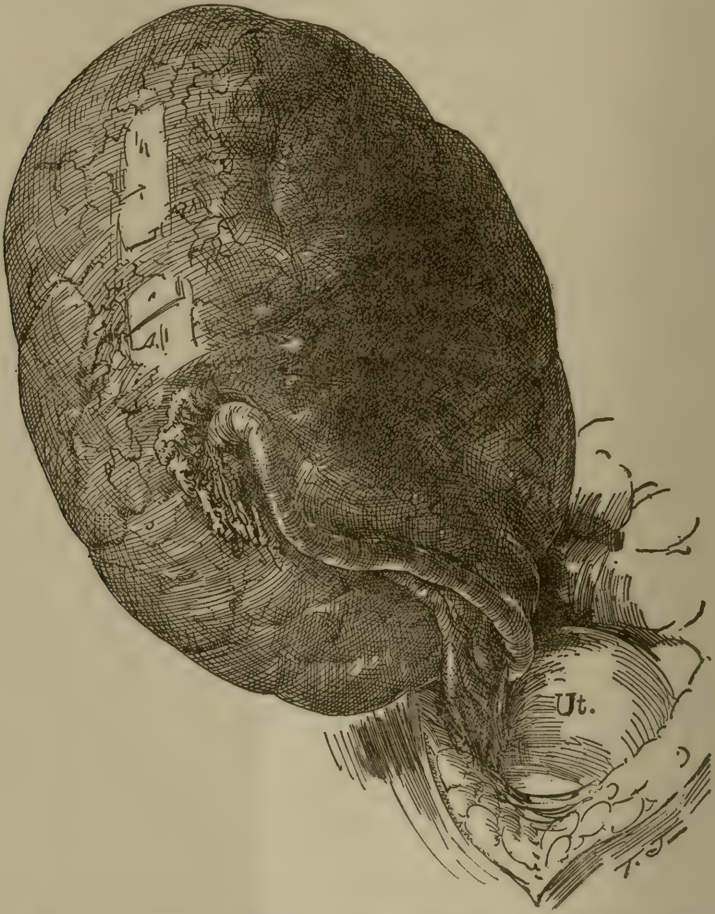

Fig. 30.—Acute torsion of ovarian cyst on its pedicle. Copious hemorrhage into cyst and into peritoneal cavity.

Postoperative Comments.—While we made the diagnosis of ovarian cyst with twisted pedicle before operation, we might better have diagnosed abdominal tumor with twisted pedicle; but since abdominal tumors with twisted pedicles are ovarian cysts in the great majority of cases, we made the immediate presumption, which proved to be correct, that this was an ovarian cyst. A *twisted pedunculated fibroid* could have been more definitely outlined and is smaller in size and usually confined to the pelvis. A *twisted hydrosalpinx*, too, is seldom if ever so large, and would also be confined to the pelvis probably. Dr. A. E. Halstead, of Chicago, in one case was able to recognize the twist in the ovarian pedicle on bimanual examination, thus making the diagnosis absolutely positive before operation. But few operators have had the dexterity in palpation to enable them to make out this point.

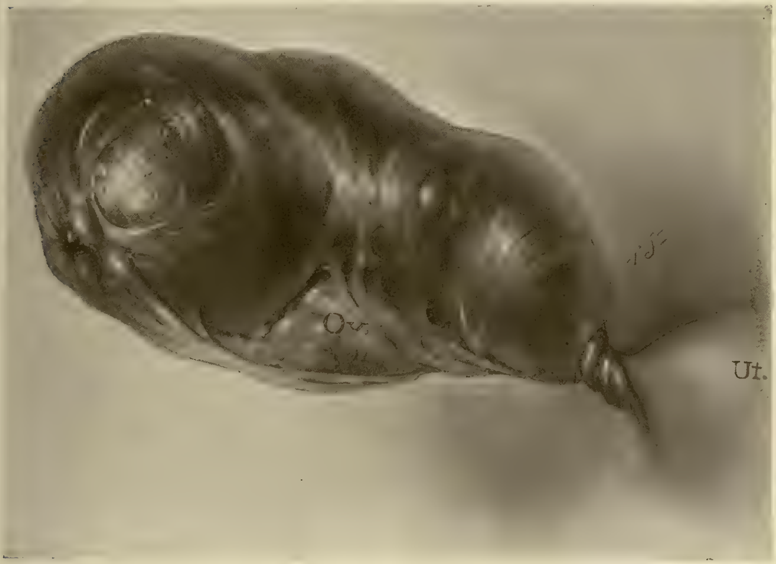

Fig. 31.—Tubo-ovarian cyst with twisted pedicle. Removal of cyst by laparotomy.

Have you ever seen a case of *massive spontaneous hemorrhage from a normal ovary?* Such a hemorrhage may much resemble that of a ruptured ectopic pregnancy in its severity. It most often comes from a ruptured corpus luteum. Occasionally there may be some slight injury preceding it. Primrose[1] reported a case of ruptured normal graafian follicle following the lifting of a heavy weight, and another case following an attack of vomiting. Fortunately, these hemorrhages are quite unusual and the symptoms of internal hemorrhage are so definite that an exploratory laparotomy is done, which enables one to make the diagnosis as well as to stop the hemorrhage. Ohman, Seedorf, Hendley, and Savage have reported similar cases.

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[1] Primrose: Hemorrhage into the Peritoneal Cavity Caused by Accidental Rupture of the Ovary, Univ. of Toronto Medical Bull., vol. i, p. 18, 1912. Also in Annals of Surgery, July, 1912.

The subject of strangulated ovarian cysts is somewhat neglected in the text-books. In fact, the entire subject of the twisting of intra-abdominal pedicled structures is not considered at length in most surgical or gynecologic works. It is usually tacked on as an abbreviated appendix to the chapter on ileus.

Strangulated ovarian cysts are not at all infrequent in the County Hospital. They present a definite clinical picture, and it is surprising with what readiness our interns make the diagnosis after they have seen their first case. Of course, where the twisting of the cyst takes place slowly without acute symptoms, the diagnosis is more difficult, but I am speaking now of acute cases. One of the best articles on the subject and one well worth reading for any abdominal surgeon is that of K. I. Sanes.[1] It includes a careful study of the literature and the report of 9 personal cases observed in nine years' time—evidently not a rare condition.

Do you know that in this enlightened surgical age 6 per cent. of patients with ovarian cysts die as the result of strangulation? Why? Because either the doctor or patient procrastinates. The cyst is recognized, but not operated. Strangulation occurs and is treated by "watchful waiting." Operation for relief of strangulated ovarian cystoma when performed early should have a lower surgical mortality than acute appendicitis operated in the first twenty-four hours. *Procrastination is the thief of life*, surgically speaking, for operation is useless in such cases when, after days of senseless waiting, fatal toxemia or nephritis or peritonitis are far advanced. It is the perverse nature of these cysts that they often take it upon themselves to twist when the patient is far enough along in pregnancy to make laparotomy dangerous because of the risk of abortion. Where both ovaries are cystic only one strangulates as a rule, but in some reported cases both have strangulated simultaneously during pregnancy, thus necessitating bilateral ovariectomy. Dr. Channing W. Barrett, of our County Hospital staff, once performed successfully such a double ovariectomy. The patient recovered and pregnancy was uninterrupted.

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[1] Sanes, K. I.: Torsion of Ovarian Cysts. Report of cases. Amer. Jour. Obst., New York, 1915, lxxi, 76.

Do you know that graafian follicles cannot infrequently be demonstrated in the pedicle of such a twisted cyst, so that when both ovaries are twisted it may be possible to save some graafian follicles in the pedicles, although practically all the ovary is resected?

Notice in the pedicle of this tumor how the dilated veins stand out beneath the peritoneum as tortuous convolutions, whereas the arteries do not appear. Edward Payr[1] some years ago tried to make out a case for passive congestion in the tumor as the cause of the twisted pedicle. He made a very elaborate study and his theory has some truth back of it; but his models and manipulations represent only partially the conditions obtaining in the abdomen. Passive congestion exerts its influence slowly. These strangulated cases occur suddenly and usually give a history of a twist, turn, bend, or strain, after which the pain came on immediately, with profound shock and collapse. Such observations seem to indicate that the twist occurs in response to mechanical conditions inside the abdomen.

The twist occasionally involves surrounding viscera. The omentum is the structure most frequently involved, but the bowel too may be caught. In such a case mechanical ileus from angulation may supplant the usual pseudo-ileus accompanying the twist. In a recent case at the County Hospital operated on by Dr. Bertha Van Hoosen the appendix was caught, twisted, and strangulated in a fold of the pedicle. If such a twist occurred slowly under the influence of congested veins in the pedicle wall, as Payr maintains, the viscera should have ample time to escape involvement.

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[1] Payr, Edward: Deut. Ztschr. f. Chir. Festschrift, E. Bergmann, 1906, lxxxv, pp. 392–451.

Do not forget that ovarian cysts may occur at any age from infancy upward. *Strangulated ovarian cysts in children* are especially apt to be diagnosed appendicitis when occurring on the right side, because one does not always bear in mind their occurrence in the young. A vaginal (or, better, a rectal) examination in the young is too frequently omitted by the family doctor.

An assistant[1] from the Leipzig clinic a few years ago proposed that one should differentiate an ovarian cyst such as this from ascites by puncturing through the abdominal wall and determining the fibrinogen content of the fluid. Fibrinogen is readily precipitated from ascites fluid by concentrated sodium chlorid solution, whereas it is absent in the contents of ovarian cysts. I think, however, that aside from the dangers of the puncture—leakage, peritonitis, bowel puncture, hemorrhage, and the like—that had I punctured this cyst and succeeded in getting in, I should have found plenty of fibrinogen due to the blood which has been poured out into the cavity during the strangulation. It has the earmarks of a test which was worked out in the library rather than in the clinic.

The most important point to emphasize about such a case is the *necessity for immediate operation*. If the patient were allowed to go along without operation with her pain kept down by morphin, she would die after some days, either from toxemia or nephritis following necrosis of the cyst. If the latter ruptures or bleeds profusely the end would come sooner. Those cysts which finally become "parasitic" following strangulation are not acutely twisted cysts like this. They are chronic cases, where the twist develops so slowly that adhesions form to the surrounding viscera and so develop a collateral circulation for the tumor before the main blood-supply is shut off.

Laboratory Examination of Tumor.—The specimen is a unilocular ovarian cystoma with twisted pedicle. No evidence of malignancy. Its walls and its contents are thoroughly suffused with blood.

Postoperative Course.—The patient ran a fever of 101° F. on the first day, but it dropped to normal on the second. She made an otherwise uneventful recovery. The temperature was probably due either to absorption of fibrin from the exuded blood or to absorption of products of protein disintegration escaping into the peritoneal cavity from the gangrenous cyst.

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[1] Dienst, A.: Ein einfaches differentialdiagnostisches Hilfsmittel zwischen Ascites und schlaffen Ovarialcysten, Münchener med. Wochenschrift, 1912, No. 50.

CASE II

History.—The patient, a German housewife, married, aged fifty-five years, was admitted to the hospital October 15, 1916, at 8.10 P. M.

At 9.30 o'clock this morning (October 15th), while bending over to get some flour, the patient experienced a sudden severe pain in the left lower quadrant of the abdomen. She straightened up quickly, but the pain continued and remained so severe that after about one and a half hours she decided to see a doctor. While dressing to go to his office she vomited for the first time. Just after boarding the street car she vomited again, much to her embarrassment. Since then she has vomited several times. In her words, she "vomits everything" she eats.

The doctor, after examining her, gave her a *hypodermic of morphin!* The patient returned home, but the pain continued severe in spite of the drug. Consequently, the doctor advised her this evening (October 15th) to come to the hospital for an exploratory operation.

The character of the pain has been cramp-like and has constantly remained localized to the left lower quadrant—no radiation. No urinary symptoms. No chills or fever today or recently. The patient had a bowel movement this morning before the onset of the attack. She has never had a similar attack before, but has enjoyed good health except for an occasional attack of tonsillitis and the discomfort her hemorrhoids occasion her. She has borne two children, both of whom are alive; one miscarriage. No leukorrhea. Menstruation ceased five years ago.

Examination.—The patient complains of severe pain in the left lower abdomen, although her contracted pupils indicate she is still under the influence of morphin. Both pupils react to light and accommodation. Her face is somewhat flushed. Temperature, rectally, 99° F. on admission; pulse 56; respirations 24. The abdomen is soft, slightly distended, and tympanitic. No dulness in the flanks. No general or local rigidity. In the extreme left lower quadrant at the pelvic brim there is some tenderness on deep palpation, but no mass. Auscultation shows peristaltic murmurs present, but not to an increased extent. No visible peristalsis.

Vaginal examination reveals a wide introitus and a cervix rather low down. There is a round, tender mass palpable in the left fornix posteriorly, rather elastic, and not easily pushed away from the vaginal wall. This mass appears to be the cause of the tenderness noted in the left lower quadrant on abdominal examination. Fluctuation cannot be definitely made out in it. It can also be felt per rectum.

Physical examination is otherwise negative.

A rectal flushing administered just after entrance to the ward returned practically clear; no blood.

Urine: Specific gravity 1020; reaction acid; no albumin or sugar; a few white and epithelial cells; no casts or blood. White count 10,200.

Diagnosis: Probably an ovarian cyst with twisted pedicle.

Comments.—Note that the family doctor gave the patient a hypodermic of morphin when she came to him. This we believe is a dangerous practice unless the patient is to remain under close observation. Morphin clouds the symptoms in acute abdominal emergencies, especially the symptoms of pain, tenderness, and rigidity. This is particularly the case when pain is not severe. This patient's pain was *not* controlled by the morphin; and from that fact we know it must have been severe indeed. The absence of abdominal rigidity is due partly to the morphin; but rigidity is always less in multiparæ than in nulliparæ. She has not had enough of the drug to cloud consciousness, although she received two injections. It is sometimes very difficult to procure a satisfactory history from a patient whose consciousness has been clouded by morphin, and a good history is as essential for the diagnosis of acute abdominal conditions as a careful examination.

Her physician, however, was considerate of us, and sent a statement with the patient telling us that she had been suffering from severe pain in the abdomen during the day and that he thought she most likely had an intussusception of the bowel, but nothing infectious or contagious. This is the least he should do for us after befogging the clinical picture with morphin. We are grateful for his statement, even though it doesn't help us any in this case.

We do not agree with his diagnosis of intussusception. Intussusception, you know, is chiefly a disease of children. Pain and tenderness are not prominent symptoms on the first day, but when present are located in the right lower quadrant. On the second day tenderness travels with the tumor up the right flank or over to the middle line of the epigastrium. Only on the third or fourth day, as a rule, is the mass and the pain and tenderness on the left side. Furthermore, the patient states she had a good bowel movement this morning. *The recent passage of a formed stool is much against the diagnosis of any form of acute obstruction of the bowel.* True, one may occasionally see a formed stool pass shortly after acute obstruction has set in. This is simply the emptying of an already full rectum and is seen more often with intussusception, I think, than with any other form of mechanical ileus. But even with intussusception it is unusual and is a strong point against an acute mechanical ileus. Obstructions due to fibrous strands, tumors, foreign bodies, angulations, and strictures give a history of previous constipation which becomes absolute obstipation when the obstruction is complete. One rarely has any stool passed with the common (sigmoid) form of volvulus, because with the rectum and sigmoid stiffened by a formed stool it is difficult or impossible for a twist to occur.

When a patient with an acute abdominal condition passes stool, especially a formed stool, reflex pseudo-ileus is a more likely diagnosis than mechanical ileus.

Pseudo-ileus of reflex origin is very frequent in cases in which an abdominal pedicle has become twisted, whether the pedicle be that of an abdominal tumor, omentum, or of some other abdominal viscus. Vomiting, prostration, tympany, diminished peristalsis, and constipation all accompany such a pseudo-ileus, *but the stoppage of the bowels is not absolute.* The doctor on duty in our examining room was impressed by the constipation due to this reflex pseudo-ileus and admitted the patient to the hospital as a probable case of intestinal obstruction. Dr. Hein, who wrote the history and got the facts carefully hour by hour, has, I think, made the correct diagnosis—acute twisting of an ovarian cyst on its pedicle. The globular mass felt in the left fornix has so definitely the consistency and shape of an ovarian cyst that the diagnosis seems to me quite certain. I think that the family doctor and our examining-room physician must have neglected to make a vaginal examination or made it with the patient too tender and rigid for accurate palpation. *Vaginal (or rectal) examination of the pelvic organs should never be omitted in a woman with acute abdominal symptoms;* but if the patient is very sensitive a negative examination does not absolutely exclude the absence of pathology in the pelvis.

The diagnosis of twisted ovarian cyst is relatively easy when left sided or when the cyst can be felt by abdominal or vaginal examination, or when its presence has been established previous to strangulation. A ruptured tubal pregnancy must be excluded in the diagnosis by the signs and symptoms of pregnancy accompanied by acute abdominal hemorrhage. A vague, indefinite pelvic mass may be felt instead of a sharply outlined, firm tumor. Hemorrhage into the cyst or, less frequently, into the abdominal cavity accompanies the twisting of an ovarian cyst, as a rule; but the hemorrhage is not copious enough to cause a severe acute anemia like that of a ruptured ectopic pregnancy unless the cyst is large and is filled with the blood or the blood escapes into the free peritoneal cavity. An added difficulty in diagnosis arises in the event of a strangulated ovarian cyst complicating pregnancy, especially in the earlier months, a not very rare combination. Sigmoid diverticulitis, left ureteral stone, and acute salpingitis may usually be ruled out with ease; but it must not be forgotten that a *patient with a strangulated ovarian cyst runs a fever when the cyst has become gangrenous.* A pedunculated fibroid may become twisted on its pedicle and so may a tubal tumor. Strictly speaking, one had better diagnose this case as twisting of a pelvic tumor on its pedicle; but strangulated ovarian cysts are so much more frequent than other pelvic tumors with twisted pedicles that that should be the probable diagnosis.

Operation.—Midline incision below navel. On opening the abdomen and pushing aside the coils of small bowel a dark colored globular mass about the size of an orange is seen to the left and behind the uterus in the pelvis. The patient is tilted into the Trendelenburg position. The uterus is drawn up into the wound and the tumor with it. The latter is a cyst tightly distended and infiltrated with black blood. As it is brought out through the abdominal wound it is seen to consist of a greatly dilated left tube (hydrosalpinx) twisted on itself a little more than a full turn of 360 degrees in a clockwise direction (the clock facing the uterus), that is, right to left. (This is the usual direction of twisting for a left-sided pelvic tumor according to Küstner's law.[1]) The fimbriated end of the tube is tightly closed by old scar tissue. The ovary is fused with the posterior wall of the cyst. The uterus is small and senile. The right adnexa appear normal.

After the tumor was brought out through the wound its pedicle, consisting of the twisted fallopian tube and ovarian and broad ligaments, was clamped close to the uterus, ligated and cut, and the mass removed *in toto*. The ligated stump was covered with peritoneum. No further exploration of the abdomen was carried out. The wound was closed in the usual way in layers without drainage, and the usual dressing applied.

Postoperative Comments.—Our diagnosis of a tumor with twisted pedicle was correct, but the tumor has proved to be a twisted hydrosalpinx, a much rarer condition, and not an ovarian cyst. This hydrosalpinx, judging by the firm closure of the fimbriated end of the tube (demonstrating it), is evidently of long standing. To what former infection it was due we cannot say at present. There is no history of venereal disease; possibly the infection followed her miscarriage several years ago.

Her family physician is to be congratulated on sending her to the hospital so promptly for operation. The important thing in

[1] Prof. O. Küstner: Centralbl. f. Gynecol., 1891, No. 11.

such a case is to recognize the surgical emergency. Had this patient been allowed to go along unoperated for three or four days, her pain controlled by morphin, the cyst would have become gangrenous and have ruptured into the peritoneal cavity. She would have suffered a profound toxemia from protein cleavage products absorbed and would have developed peritonitis, too, if the tube still contained bacteria. These cases, like strangulated ovarian cysts, when allowed to follow their natural course terminate usually in death. Acute nephritis, cloudy swelling of the parenchymatous viscera, reflex ileus, and even acute yellow atrophy of the liver are some of the terminal complications.

Dr. A. D. Bevan, of Chicago, told me that in looking up the literature of fatty degeneration of the liver following chloroform-poisoning he found that a number of cases had occurred in connection with strangulated abdominal or pelvic tumors, frequently ovarian cysts. He supposed that the two causes might have worked together in producing acute fatty degeneration of the liver. I am much inclined to think him correct, for nearly all the cases of strangulated tumors with acute yellow atrophy or fatty degeneration of the liver which I have run across come from the German literature, and the Germans in the past as in the present have always been great devotees of chloroform narcosis.

Did you know that the normal tube and ovary sometimes undergo spontaneous torsion and strangulation just as the testicle does? Auvray[1] has collected a series of such cases. It is a condition which should be borne in mind in cases of severe acute pelvic pain. Whitacre[2] reports 2 cases of hydrosalpinx with twisted pedicle, and states that the rarity of twisting of a hydrosalpinx is due to the frequency with which adhesions are present which make twisting impossible. He also calls attention to the fact that pain is marked, while tenderness is relatively slight.

Postoperative Course.—The patient made an uneventful recovery without fever, the wound healing primarily. She left the hospital two weeks after entrance.

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[1] Auvray: De la torsion spontanié de la trompe et de l'ovaire normaux, Arch. men. d'obstét. e. d. gyn., July, 1912.

[2] H. J. Whitacre: Hydrosalpinx with Twisted Pedicle, Jour. Amer. Med. Assoc., May 20, 1916, p. 1614.

CLINIC OF DR. WILLIAM HESSERT

Alexian Brothers Hospital

ARTHROPLASTY OF THE KNEE

Summary: A patient with bony ankylosis of the knee the result of suppurative arthritis occurring as a complication of acute osteomyelitis of the tibia; features of acute osteomyelitis illustrated in history of present case—mode of onset, pathology, errors in diagnosis, proper method of drainage, sequestrotomy of entire diaphysis, regeneration of diaphysis; technic of arthroplasty—exposure of joint, fashioning the flaps, separation and reshaping of ankylosed bones, reconstruction of the joint; difficulties and dangers of the operation—how to meet them; result in present case after two months.

The case for operation this morning is a very interesting one because it presents some of the acute phases of osteomyelitis, together with results of delayed treatment, and the serious joint complications that arise from such delay. It is for the latter condition that the patient is brought here today.

This boy is an old patient of mine. He came in here on July 11, 1910, with the following history:

The patient, a schoolboy aged ten years, was admitted to Alexian Brothers Hospital July 11, 1910. His previous history was negative; he had always been rugged. July 4th, one week before admission, he was running upstairs and struck his left leg, but without great violence. That night he felt pain in the left leg and had a chill, two very prominent symptoms. The next day he had fever, the pain became worse, and he could not leave his bed. The family physician was called and treated him for rheumatism. The pain and fever continued for one week, and he was brought to the hospital with a fever of 103° F. and a pulse of 116.

Physical examination was negative except that the left leg from the ankle to the knee was swollen and exquisitely tender. A diagnosis of acute suppurative osteomyelitis was made and an immediate operation performed.

Before speaking of the operation that was done at that time I want to direct your attention to that history. This happened in the summer time, July 4th. These cases usually start with the history that the child was playing violently and injured the leg or the arm, or became tired or overexerted while skating, and then suffered a trauma, becoming sick within twenty-four hours with severe pain and chill, the chill indicating the infection. This happened in the summer, there was a slight trauma, but no chilling. Another thing of interest—there was no previous history of infection to be ascertained. He had no tonsillitis, no infectious or contagious disease any time previous to the onset of this trouble, so we were unable to determine the exact source of the infection. It must have come from some focus somewhere, but we are unable to determine its location. Taking it altogether, we have a very typical history of an acute osteomyelitis which was neglected. This case should have been taken care of the second day or, better, within the first twenty-four or forty-eight hours instead of being treated for a week for rheumatism.

The operation at that time (in 1910) consisted of an incision that was made throughout the length of the tibia. There was pus under the skin and the periosteum was very extensively separated from the bone by the pus. In fact, the entire length of the tibia had been denuded of its periosteum. I chiseled open the medullary cavity and more pus and necrotic tissue were found. The wound was left wide open and hot dressings applied. The specimen (Fig. 32), which I still preserve, shows the extent of the infection. This specimen shows how a crater was chiseled into the bone and the medullary cavity exposed. In a case of this kind I will say it is not necessary to curet actively. All that is necessary is to relieve the pressure by a trephine opening, or in the more extensive cases to make a large opening in the shaft of the bone. That was done here very extensively.

The patient was relieved of his pain, but the fever continued up to 104° F. Ten days after the operation pus developed under the left deltoid muscle and the temperature rose to 105.2° F. In other words, he had a metastatic abscess in the subdeltoid bursa on the left side.

About three weeks after admission it was found that the entire shaft of the bone was loose, separated at its epiphysis both above and below. The original wound was still largely open, so the shaft was chiseled through at its middle and both fragments easily removed, as is illustrated by this specimen (Fig. 33). It was especially noted at that time that the periosteum was thick and that under it there was a thick layer of new bone. Where it was necessary this crust of new bone was separated from the old shaft, but none of the new bone was removed. After removing the sequestrum there was left a fairly good hollow shaft. The leg was then placed in a cast. Wound healing was rapid and very satisfactory. In about six weeks it had almost completely healed.

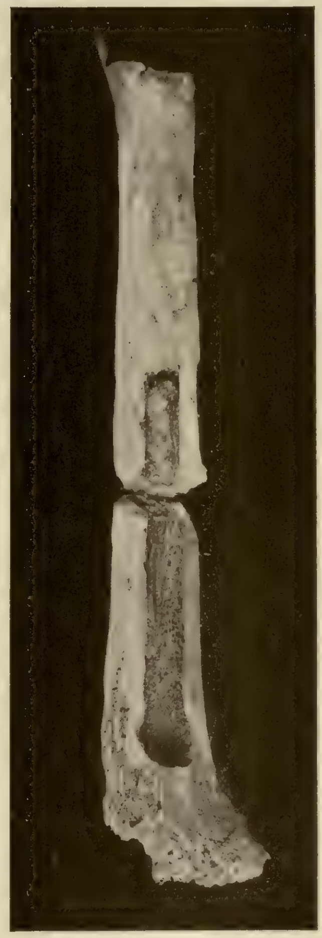

Fig. 32.—Specimen representing entire diaphysis of tibia, necrotic as the result of acute suppurative osteomyelitis.

While healing in the leg was progressing favorably, conditions were precipitating in and about the left knee of very serious nature. About the time of the sequestrotomy the region around the left knee became more and more swollen and painful and a cellulitis developed about the joint. It became necessary to incise and drain both the joint and the cellular tissue. Incisions were made on each side and drains inserted. The boy was in the hospital in all about three months, but at the end of that time the wounds were practically all healed. Three months after removal of the entire shaft of the tibia he was able to bear some weight on the leg.

In regard to this history, here we have a boy who gives a history of a slight trauma, is immediately taken with chills and fever and exquisite pain. Now, the question of osteomyelitis is a very similar one to that of acute appendicitis and peritonitis, in that it demands the earliest possible operative interference. It is lamentable that the medical profession is so lax when it comes to acute osteomyelitis, and that they have not learned that a case that gives such a plain history should have immediate operative interference. The treatment consists in immediate incision and evacuation of the small focus of pus in the cortex or medulla. These clinical symptoms are produced by the lodgment of a small clump of bacteria in the shaft of the bone or in the medullary cavity, rarely under the periosteum. This starts up a little local abscess, which is the cause of the fever, chill, and pain, and the earliest possible evacuation of this pus is imperative. The moment an infection located in the bone starts, it becomes progressive. The infection travels through the Haversian canals and through the cortex until it reaches the periosteum. It gets under the periosteum and the periosteum is raised up and is separated from the bone. The longer the condition continues untreated, the more periosteum is separated and the more rapid and extensive is the necrosis. In this case after the duration of a week the periosteum was almost entirely lifted off from the shaft of the bone, which was thereby deprived of its nutrition, and at the time I operated, a week after the onset of the symptoms, there was every evidence that the entire shaft was going to become necrotic. Therefore, of vast importance is the early diagnosis and early operation, which is just as important as the early diagnosis and early operation in acute appendicitis. If that fact could only be borne in mind by the general profession we would see fewer cases of sinuses and chronic bone disease.

Another important phase of this subject is the subsequent treatment, and whether it is to be conservative or whether it is to be radical. The question arises whether to leave this necrotic shaft in place, and if not, when to take it out. There is no question that if the necrotic shaft is taken out too early, even though it is removed subperiosteally, if there had been no development of involucrum, there will be no regeneration. I have had that experience and I have seen clinical cases where this occurred and where an extensive plastic operation had to be done later on. If this is not done, the child is left with a great deformity. So in the after-treatment of these cases after the primary evacuation of pus it becomes essential to wait until a sufficiently massive involucrum has formed before removing the sequestrum. At least no operation should be done under three or four weeks. In this case I waited three weeks until a well-developed involucrum had formed before I felt safe in removing the shaft of bone. Supposing I had not removed the shaft of the tibia at that time, but left it alone, what would have happened? As time went on the involucrum would have become more massive and thick, but sinuses would have persisted, and it would have been necessary eventually to go through the involucrum and remove what remained of the necrotic tibia, so I think I would not have gained anything by waiting.

Finally, the boy comes in today with a condition that is rather unusual, that is, an involvement of the joint adjacent to an osteomyelits. As a rule the epiphysis forms a barrier for the infection and the infection does not drill through and infect the joint. In this case the knee-joint was infected and the periarticular tissue was involved and drainage was necessary. That opens up a question upon which a great deal can be said in regard to septic infection of joints. I agree with the teachings of Murphy that *we should not drain a septic joint.* A joint that has been drained with rubber tubes will become stiff. All the joints that were drained in the old days became stiff joints, whereas we have of late years been able to aspirate and inject the infected joints and avoid the occurrence of ankylosis, so that infections in the joint should not be drained with rubber tubes, but should be aspirated and injected a number of times with 2 per cent. formalin and glycerin. In this case today, owing to the cellulitis in and about the joint, it was necessary unfortunately

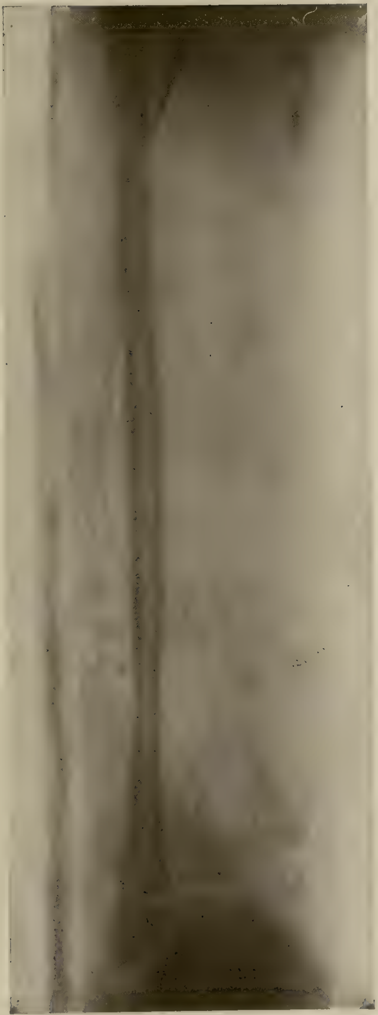

Fig. 33.—Appearance of leg after subperiosteal resection of entire diaphysis. A faint shadow indicates deposit of bone under periosteum.

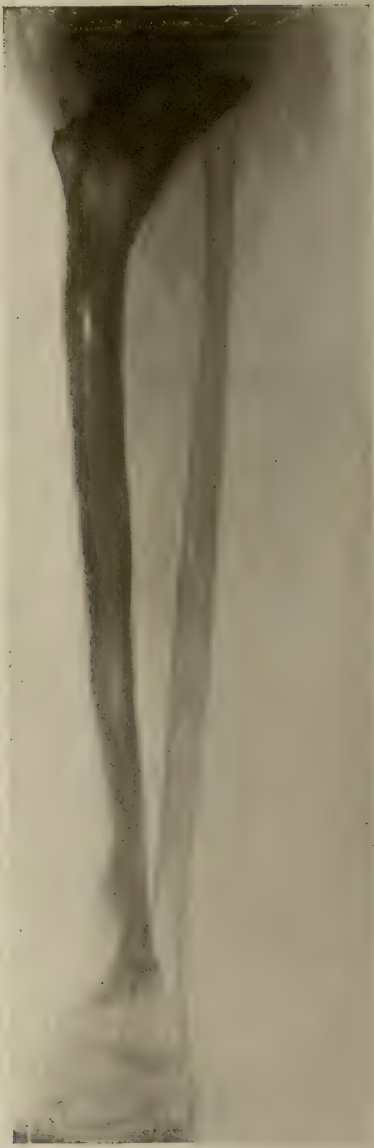

Fig. 34.—Same as Fig. 33 four months later. The faint shadow of bone has developed a new tibia.

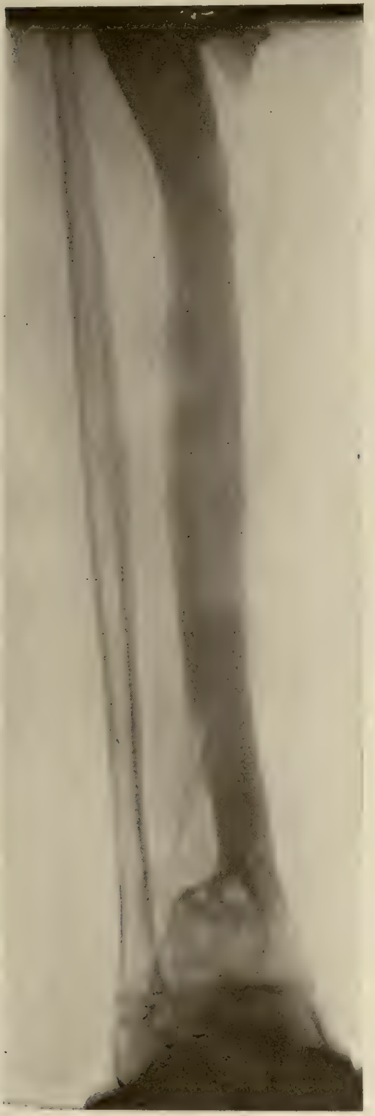

Fig. 35.—Eight months after sequestrotomy the tibia has reached normal size and function. Note lower epiphyseal line preserved. Upper one does not show, but was destroyed.

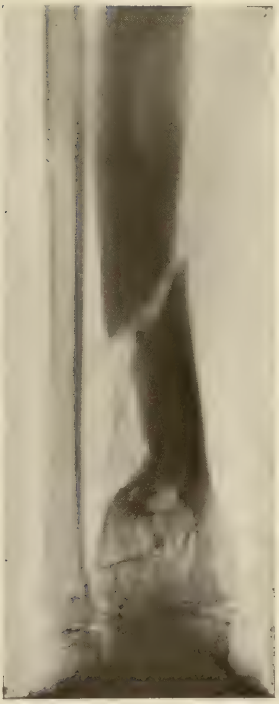

Fig. 36.—Traumatic fracture of regenerated tibia a year later. Union took place in a normal manner.

to drain with rubber tubes, and the inevitable happened. In other words, this joint became absolutely rigid, as is shown by a series of pictures that I have here. It took about five or six months for the tibia to regenerate and regain its normal size.

This picture shows the condition after the sequestrotomy while the leg was in the cast (Fig. 33). It shows just a very faint shadow here, which is all that is left. A subsequent picture shows the gradual thickening of the shaft (Fig. 34). About three months after the operation the boy was walking, and within six months the shaft had completely regenerated, but, as I said, the main complication was the involvement of the knee (Fig. 35). The next year after he was here he fell and fractured this new bone. This regenerated tibia was fractured, but it healed up perfectly like an ordinary bone without any trouble (Fig. 36). Unfortunately, however, the boy was left following the osteomyelitis and joint drainage with ankylosis of the knee at an angle of about 130 degrees, as I have already intimated. While the boy was able to walk and get around very well, he was considerably handicapped. He comes back and says to me that "he is handicapped in his work, that he cannot hold his job, nobody wants a lame boy," and his outlook in life is not at all good. He is a bright boy, but he is unable to make a living. He cannot hold his job for any length of time. That is my reason for trying to do something for this boy. He comes in with an absolute ankylosis. The *x*-ray picture shows that condition. This is an extreme case of bony anklyosis. As you look at the *x*-ray picture you see practically no line of cleavage. The two are absolutely fused. The patella is fused to the anterior surface of the femur (Figs. 37 and 38).

Now the problem is to restore that joint. In other words, if we can reproduce that which happens in the case of a non-union of the bone in a fracture, we can be more or less successful. We realize that success in the knee-joint is difficult to obtain. Arthroplasty of the knee has not been as satisfactory as arthroplasty of the hip, elbow, or shoulder. The ease with which they can be preformed is about in the same relation. The hip is fairly easy and gives the best result. Next comes the elbow and next comes the shoulder, and last comes the knee. Why is it that the knee-joint is so hard to restore? The knee-joint is a different kind of a joint from the hip. The hip is a ball-and-socket joint and the knee is a hinge-joint. While the hip is built to bear the weight of the body, the mechanical difficulties are not as great as they are in the knee. In this arthroplasty we must succeed in restoring motion, but that is not enough. We must

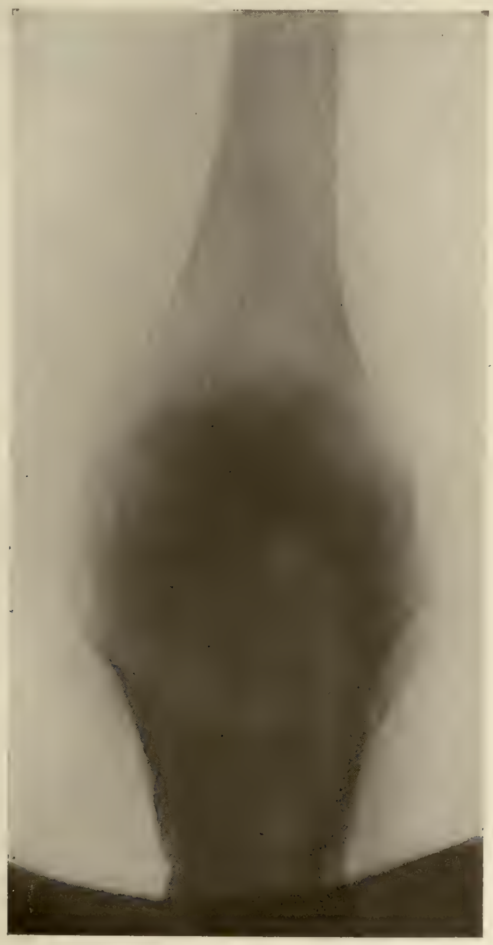

Fig. 37.—Anterior view of ankylosed knee. Joint detail almost effaced.

succeed in restoring to the patient a weight-bearing joint. I must be able to make a new joint here that will not only have good motion, but which will be weight-bearing, and one that will be plumb and useful. If I cannot do that the boy will be better left alone. More cases of successful arthroplasty of the hip and elbow are reported than of any of the other joints. The

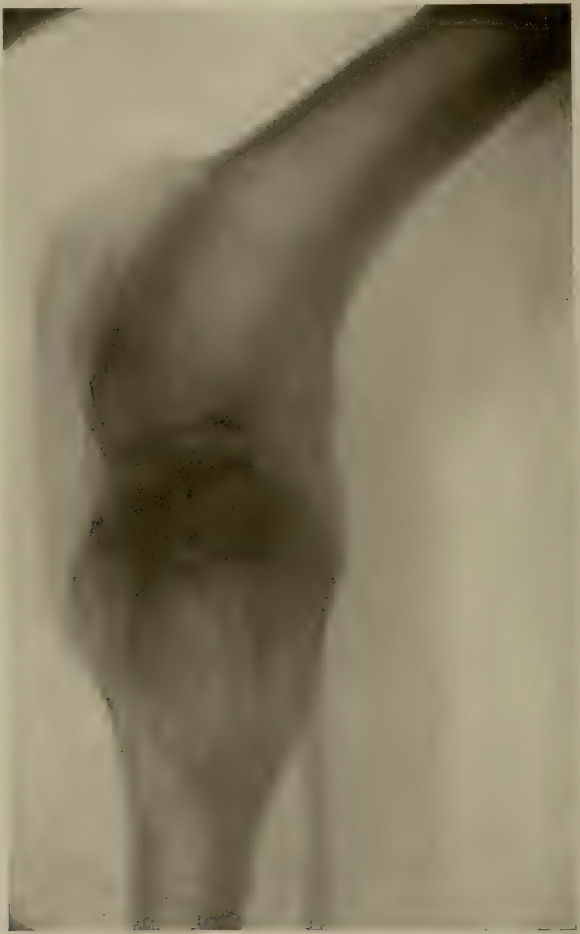

Fig. 38.—Lateral view of ankylosed knee-joint. Patella is fused to femur. Note bony union between femur and tibia. Bones display the rarefying osteitis of disuse.

best of operators have had good cases and have had bad ones. They have had cases in which the ankylosis recurred, so that we realize the very serious problem before us.

What do we propose to do? What are the successive steps of the operation? First, we will make two lateral incisions anywhere from 5 to 7 inches long on either side of the patella. Then we will have to chisel the patella loose from the femur. Then we will make our flaps consisting of fascia and capsule. There is no synovial membrane here. We will make fascia and fat flaps and interpose them between the bones. Then we will have to chisel the tibia from the femur, using a special set of curved chisels in order to preserve the convexity of the femur and the concavity of the tibia. Then we will have to remove enough bone from the tibia to enable us to straighten the leg, bearing in mind that the placing of too great tension on the tissues in the popliteal space is fraught with imminent danger. If we straighten that leg too forcibly and put too much tension on the popliteal vessels we are liable to get necrosis of the leg, and not only will the leg be hazarded, but even the patient's life. We have a thousand minor details to think of in the performance of this operation. After separating these bones and loosening the patella, and making our flaps, the flaps will be interposed between the tibia and patella and the patella and the femur. The disposition of the patella will have to be settled after we get in. Possibly we will turn the patella completely around through an arc of 180 degrees. You know the upper surface of the patella is covered by fascia and aponeurosis, and by turning it once around it brings that fascial plane in contact with the femur. We must absolutely avoid the recurrence of adhesions between the patella and femur. After removing all the projecting spiculæ of bone we smooth off the bone surfaces. As you know, we will sacrifice the lateral ligaments. You will say, are you taking away the entire ligamentous supports? We are going to remove the crucial ligaments if necessary. Possibly we will not be able to identify them. We will also remove the lateral ligaments. Some operators remove the posterior part of the capsule, though I am not in favor of it. We must bear in mind the location of the external popliteal nerve as it goes around the head of the fibula, so as to avoid injury of this important structure. So you see the proposition is very complex. Upon what are we going to depend, then, for stability? If we remove the lateral ligaments and remove the crucial ligaments, what is going to make that joint stable afterward? Are we going to have a flail joint? No, we are not. It is remarkable how the ligaments will regenerate, especially after the joint is put to use. We have all seen cases of non-union in fractures where there was joint capsule, cartilage, and synovial membrane. In other words, there was a complete joint regeneration, because motion occurred at the site of the fracture. If a joint like this is put to use, the external ligaments and the ligamentous attachments will regenerate. That has been the observation of the men who have done this line of work, but we depend to a large extent upon the preservation of the intercondyloid ridge and the tubercles of the tibia in preventing lateral displacement. The leg must also be made absolutely plumb, so that when the patient stands the axis of the limb will be normally preserved. If there is too great an angle outward or inward, it is going to cause tension on either side, so, you see, we have got to do a mechanically perfect job. We have got to get this leg plumb even though we remove the capsular ligament, and in order to do that we must preserve the intercondyloid ridge of the tibia. That will prevent lateral displacement. After completing that part of the operation the leg is extended and a Buck's extension of 15 to 20 pounds is placed on the leg and kept on for a month at least to prevent the muscles of the leg from contracting, that is, to prevent the hamstrings and the quadriceps from pulling up against the transplant and pressing the transplant between the tibia and the femur. If the transplant should become atrophied and necrotic, we would get a recurrence of the ankylosis. It is absolutely necessary to apply a Buck's extension for at least a month. At the end of a month very gentle passive and active motion is started and the patient is allowed, after several weeks more, to get up, but not to put much weight on the leg for at least two months. Violent active or passive motions are not good. They tend to traumatize the joint.

There is one more point. Shall we use a free transplant or a pedicled flap? Now, both plans have been tried, and while it is the tendency now to use the free flaps of fat and fascia, I believe the experience has been, and it has been Murphy's experience, that the pedicled flap, after all, is better than the free flap. I will use a pedicled flap with the pedicle downward or upward—it does not make much difference—and overlap the flaps in the midline. This will probably be better than a transplant. I think it will have more thickness and will be less likely to atrophy than a transplant in this region.

So much, then, for the present condition and our plan of operation. We will now proceed with the operation.

Operation.—Now as to the preparation of the patient: This boy's limb was shaved yesterday morning and a green soap dressing put on until last night. Last night that dressing was removed and the limb was thoroughly scrubbed and treated with alcohol and McDonald's solution. We have been using McDonald's solution in this operating room for several years with great satisfaction. I will not say that the results have been better than with iodin, but it has one advantage over iodin in that it is not so irritating. I have seen a number of cases of dermatitis produced by iodin. Another thing is that the solution can be applied on a wet surface, which is not the case with iodin. Iodin cannot be used on a wet surface, the skin must be dry. At times the skin cannot be kept dry, so in that case the iodin is not efficient. Iodin will not penetrate the skin cells that have absorbed moisture. Iodin is not at all miscible with water, so with iodin it is an absolute necessity that the skin be kept dry. McDonald's solution can be applied to a wet surface. I am very partial to this solution. We use it as a routine in all cases where we would ordinarily use iodin.

It is perfectly obvious that this knee is completely ankylosed at an angle of 130 degrees. You see the old scar on the anterior surface of the tibia. You see the scars on the inner and outer surfaces of the region of the knee-joint. These represent the drainage openings that were made when the boy had his infection of the knee. Owing to the rigidity of the knee and lack of use of the muscles on this side there is a difference in the circumference of the two legs of about 1½ inches. Another point of importance that has not been brought out yet is this, that owing to the involvement of the upper epiphysis of the tibia by the infection burrowing through the epiphysis into the joint, the epiphysis was disturbed and the epiphyseal cartilage was more or less destroyed and the growth of the leg was retarded, so this tibia is 1½ inches shorter than the other one. That is unfortunate, because even after we have succeeded in straightening the leg, it will still leave this leg 1½ inches shorter than the other one, but I feel certain that if I can restore motion to this rigid joint we will have done this boy incalculable benefit.

Now we have very carefully applied the McDonald solution to the leg, thigh, and knee. The question of using a constrictor arises. Sometimes one does and sometimes one does not. I am not going to use a constrictor here. I do not think we will have very much bleeding. I dislike putting on a constrictor for too long a time. Of course a constrictor can be left on for an hour or an hour and a half with perfect safety, but with a constrictor left on for a long time, for one and a half hours or more, there is likely to be some disturbance of the nutrition of the part, and there is likely to be more postoperative oozing than there would be otherwise. Now it is almost needless to say that in the performance of this operation we exercise extreme care in following out the non-contacting proposition, I might call it the Lane technic, the avoidance of touching the wound with the fingers or touching any instruments that go into the wound, or touching any part of the instrument that subsequently goes into the wound. That principle has to be observed from beginning to end, especially in bone cases, but, of course, it should be observed in all operations. If in all our operations we followed out that principle we would have little if any infection, but especially is that true in the bone operations. The sponges are not picked up with the gloved hand, but are picked up with forceps.

We will make the outer incision a curved one about 7 inches long, extending somewhat above the patella and below the tuberosity of the tibia (Fig. 39, *A*). I could make a horseshoe flap with the convexity upward or downward, but experience has shown that these flaps are very prone to become necrotic, which is a very undesirable complication. Now we are separating and undermining our skin-flap from each side so as to expose the tissues and structures beneath. We have in view now the outer aspect of the knee and the external lateral ligaments. I shall now make mental measurements of the size and location of the external lateral flaps, which ordinarily should be about 2 or 2½ inches wide at the base and 2 to 2½ inches long. I am determining now the junction of the tibia and femur with my forceps. The base of this flap is going to be a little bit beyond the margin of the external tuberosity. Here is the ligamentum patellæ. We will not disturb that. As I said before, in fashioning this outer flap we go through to the bone, catching the fascia and all the tissues down to what is called the synovial membrane. Now I am fashioning the outer margin of the flap. Unfortunately, there is no fat here at all. Now I am dissecting this outer flap from above downward, taking all the tissues down to the lateral aspect of the femur. This dissecting back of the flap is about as difficult as though we were dissecting back the periosteum. There goes one of the articular branches. You always want to make your flaps larger than you think you want them to be, especially when you are making free flaps. It is wonderful how they shrink in size. It is like making flaps for an amputation—always make large thick skin-flaps and they will always be right. We have dissected the flap with the base down, about ¾ inch beyond the junction of the femur and the tibia (Fig. 39, 2).

Now I make an incision on the outer side of the knee through the lateral extension of the biceps, so as to expose the patella, because we must expose the patella in order to chisel it loose from the femur, but preserving the ligamentum patellæ. It is utterly impossible to separate the patella from the femur with a scalpel. As you see in the *x*-ray picture there is absolutely a bony fusion. In fact, there is a fusion of everything. There is scarcely anything left that you can determine as to its identity.

Now we will go to the other side. We will fashion our flap over there before we loosen up the patella. We will make an in-

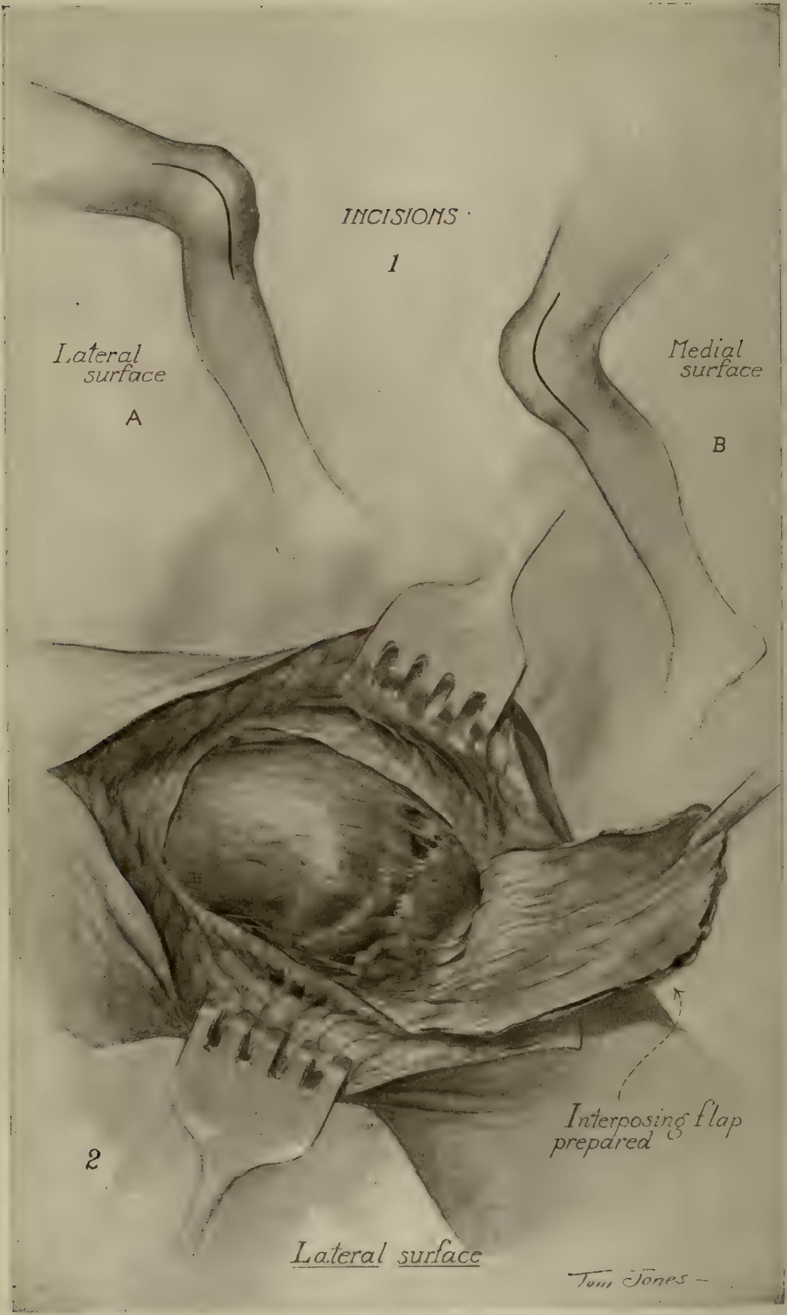
INCISIONS
1
Lateral surface
A
Medial surface
B
Interposing flap prepared
2
Lateral surface
Tom Jones

Fig 39.

cision on the inner side, starting below and behind the tuberosity of the tibia and carrying it up above the patella, so that the old scars do not come in (Fig. 39, *B*). We readily separate the skin from the underlying surface. Now let us see where we are going to fashion our flap on the inner side. We will start about ¾ inch below, bearing in mind the location of the patella and bringing our incision up about 2½ inches. Now we start dissecting down, keeping close to the bone as before. We make an incision beginning above the patella and loosen up the patella. Then we will be ready in a moment to chisel the patella loose. This is anything but easy, because the patella is very firmly united to the anterior surface of the femur. First we will loosen it up from the outer side and then we will proceed from the inner side. Now I have the patella loosened so I can get the chisel under it all the way across. Now we proceed to the separation of the tibia from the femur. We first determine the margin of the tibia here. We are retracing the tendon of the patella inward. Now, using a curved chisel, I am going to proceed to loosen up the outer condyle, endeavoring all the time to preserve its round contour. That is why I am using a curved chisel. Now on the inner side we will do the same thing to determine the junction of the tibia and femur and separate them. In some favorable cases of ankylosis the tibia and femur are ankylosed only for a short distance, but as you will see in this *x*-ray picture the bones are adherent over a very wide surface and require very wide chiseling apart. The dangerous place is the popliteal space. There is no sign yet of this giving. We have not yet succeeded in chiseling it off enough. You will agree that this is anything but an easy task in the face of such an extensive ankylosis (Fig. 40, 3). Now we have it loosened. Now we must be extremely careful not to make any violent efforts at extension, because we have our popliteal vessels on tension. I think before I make any attempt at extension I will cut away more of the tibia, bearing in mind that I want to preserve the intercondyloid ridge. I will take off 1½ to 1¾ inches of the

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Fig. 39.—1. Incisions on the inner and outer aspects of knee. 2. Wound shown retracted. The quadrilateral interposing flap has been dissected off close to the bone with its base downward.

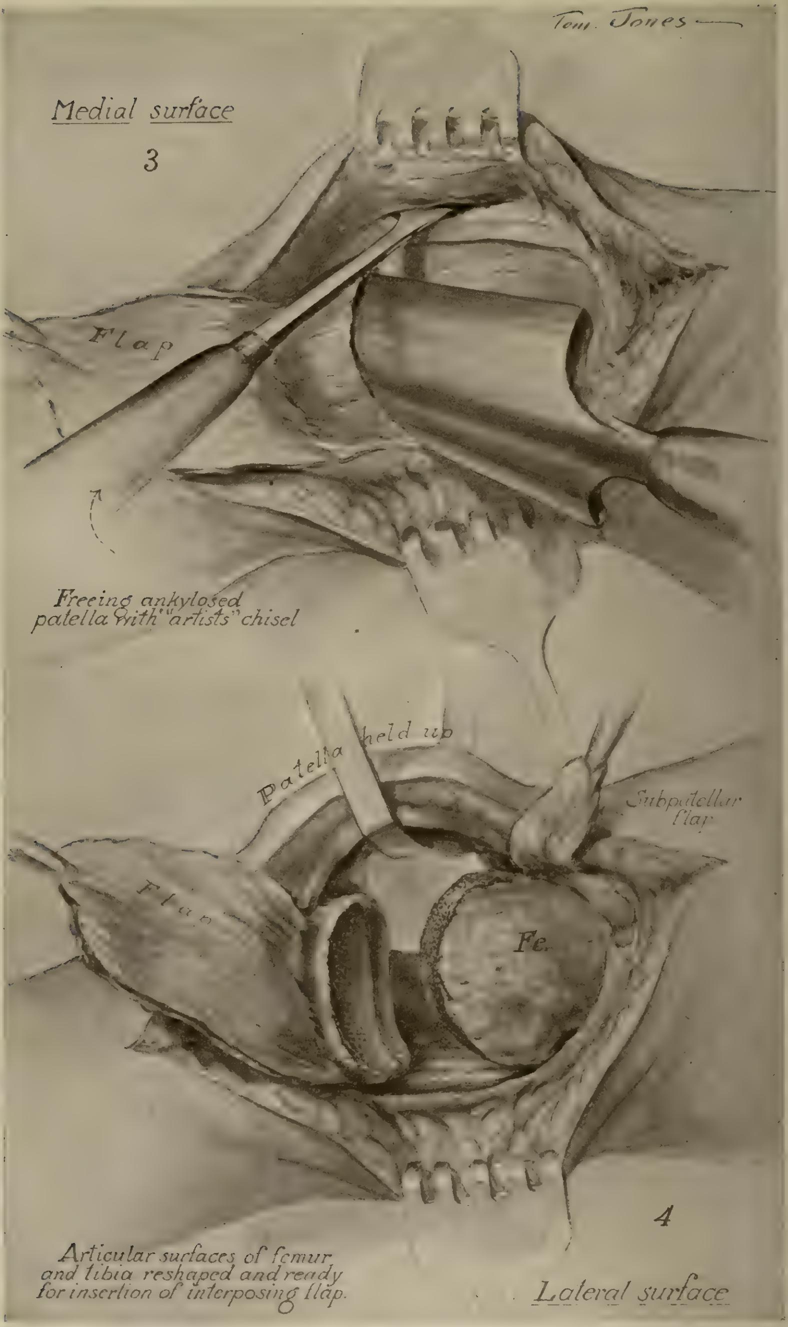
Tom Jones
Medial surface
3
Flap
Freeing ankylosed patella with "artists" chisel
Patella held up
Subpatellar flap
Flap
Fe.
4
Articular surfaces of femur and tibia reshaped and ready for insertion of interposing flap.
Lateral surface

Fig. 40.

tibia. We are fashioning the concavity in the upper end of the tibia to serve as a resting place for the condyles of the femur, preserving the intercondyloid ridge. We will not try any extension until we get the other side chiseled off. The remnants of the crucial ligaments are attached to the tibial spine. I think we have got about enough of the tibia chiseled away. We will round off the end of the femur now. There are some projections of bone on the internal condyle of the femur that I must take off (Fig. 40, 4). Now we must turn the patella over. I will try and sew these two flaps together so they will join in the midline. These flaps are so long that they do more than come together in the middle, they overlap. I will change my plans on that. I will suture the edge of the outer flap to the base of the inner, and then bring the inner over and make it even better. That doubles it.

Now we are starting to reconstruct, sewing up our incision. Now we have this all covered by flap. Now we have turned the patella completely over and we will suture the edges to the edges of the flap. Even though we have removed the lateral ligaments and the crucial ligaments and disturbed the stability of this joint considerably, yet when function is once re-established these ligaments will re-form. If everything is favorable and no infection occurs, these capsular ligaments should give us no trouble. Now the leg is drawn out and everything is covered with flap (Fig. 41). It bends nicely to a right angle. We will put in two gutta-percha drains, one on either side. There is only one thing about this case that saves it from being the very bad proposition that it might be, and that is, that we did not have the joint flexed at a very acute angle. At least we did not have that difficulty to contend with. Otherwise, it could not have been much worse. We get cases where the femur and tibia are in contact for a distance of about the size of a half-dollar and you can chisel it off

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Fig. 40.—3. The large curved chisel is being driven between the bones. It requires considerable work from all sides before the union is broken up. The small chisel is shown in the act of loosening the patella. 4. The illustration is designed to convey an idea of the amount of bone removed. The lower ends of tibia and femur have been entirely remodeled.

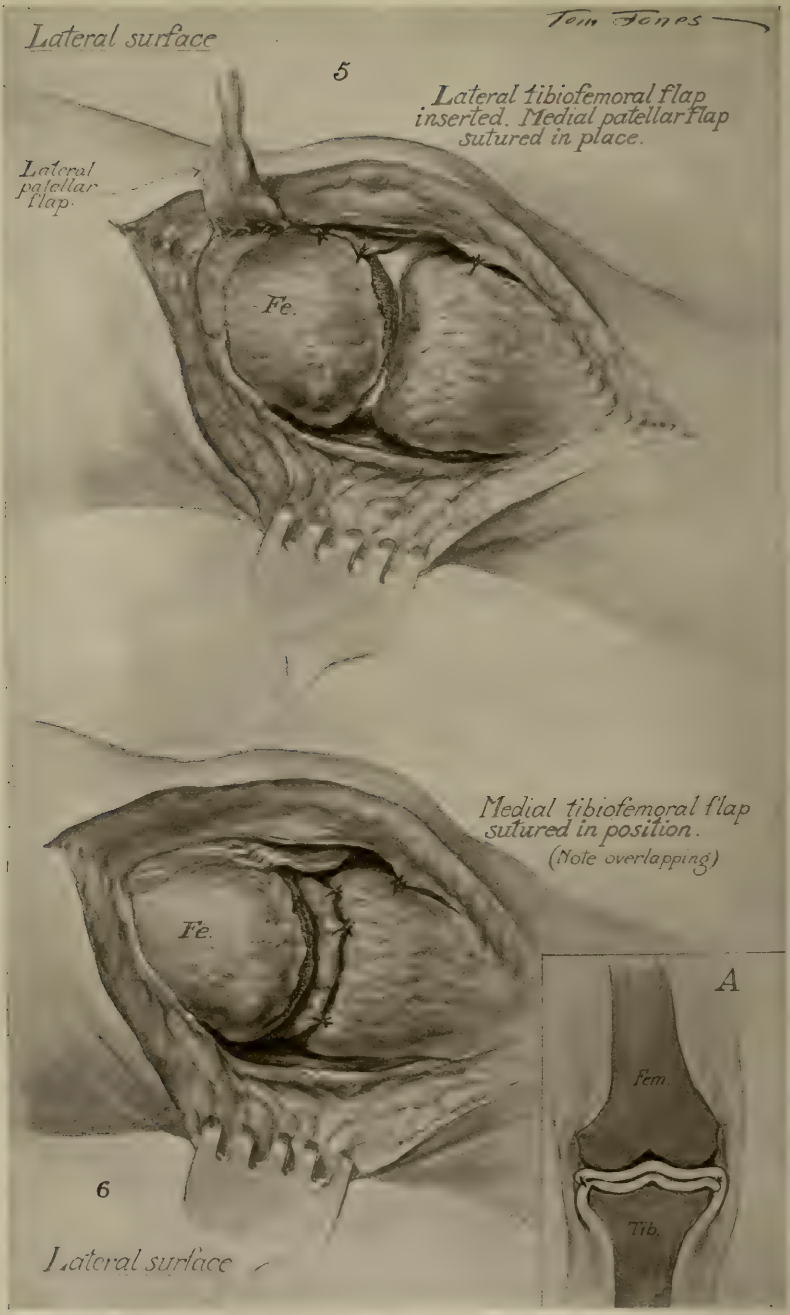
Tom Jones
Lateral surface
5
Lateral tibiofemoral flap inserted. Medial patellar flap sutured in place.
Lateral patellar flap.
Fe.
Medial tibiofemoral flap sutured in position.
(Note overlapping)
Fe.
A
Fem.
Tib.
6
Lateral surface

Fig. 41.

and the joint does not have to be disturbed to such an extent. Here we had to take off so much of the tibia in order to get flexion. It is not enough to get extension, but we must get flexion. As the doctor makes traction here, you see there is a nice separation of the bones. This drainage is put in to carry away the oozing. There is considerable oozing, but we would have had the same oozing had we put on a constrictor. The dressings are now applied. We will put on a posterior splint and tomorrow we will put on a Buck's extension.

ADDENDUM

The prolonged anesthesia and the hemorrhage resulted in considerable shock to the patient, but he responded nicely to hypodermoclysis and intravenous injections of digalen. After the immediate danger of the operation had been overcome, there remained two further factors which were the source of the greatest anxiety to the operator. The first was the condition of the external popliteal nerve, and the possibility of its having been injured during the operation. The second was the state of nutrition of the leg. While the position of the nerve was constantly kept in mind, it was still possible that it might have suffered injury or been severed entirely. The resulting paralysis, especially if permanent, would be almost, if not quite, as bad as the original trouble. As to the second point: Everyone knows that in straightening out a knee-joint which has been fixed in flexion for years, with the popliteal vessels in all likelihood surrounded by scar-tissue, there is danger of narrowing the lumen of the vessels sufficiently to cause temporary embarrassment of the circulation or even gangrene of the leg.

The terrible suspense was ended next morning, when, to our great joy, it was noted that not only was the circulation of the foot perfectly normal, but voluntary motion was also possible in

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Fig. 41.—5. All flaps except the lateral patellar have been fixed in place Note the space still existing between the bones, and the absence of pressure. There is no tissue with which to reconstruct lateral ligaments. 6. Final appearance before closure of wound. *A*. Schematic anteroposterior view to show contour of reconstructed joint with its interposed cushion of transplant.

all directions. There had been considerable pain which was almost instantly relieved when the extension was put in service. There was also quite a bit of bloody oozing, but the drains could be dispensed with after the fifth day. The wound healed by primary intention, eliminating the third and not the least source of danger—infection.

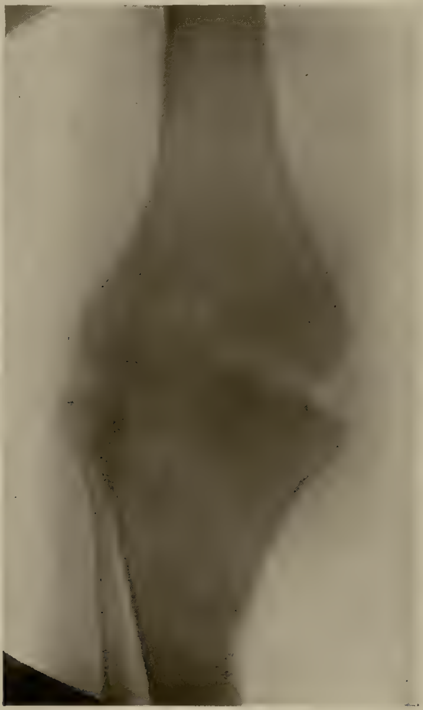

Fig. 42.—Arthroplasty for bony ankylosis of the knee soon after operation. Anterior view shows perfect adaptation of the remodeled bone ends. Position of head of fibula gives an idea of the amount of tissue removed. Note that the long axis of the leg is truly preserved.

The extension was maintained for four weeks, during which time the patient was entirely comfortable and moved his knee-joint voluntarily. After a month in bed the boy was about the hospital on crutches for a month longer, receiving massage and gentle passive motion. At the time of his discharge from the hospital, two months after operation, his condition was as follows:

Extension, passive and active, is complete and free. From the extended position, flexion is possible actively for about 60 degrees; the leg can be bent passively a little further. A very important feature to which especial attention is directed is the fact that the joint is remarkably strong and firm. That this should be so after the removal of the main supports of the joint, the crucial and lateral ligaments, is interesting. There is but very little lateral motion at the knee-joint, and the line of the leg is in perfect plumb, as shown also by the radiograms (Figs. 42 and 43). The leg is absolutely weight bearing, with no sense of

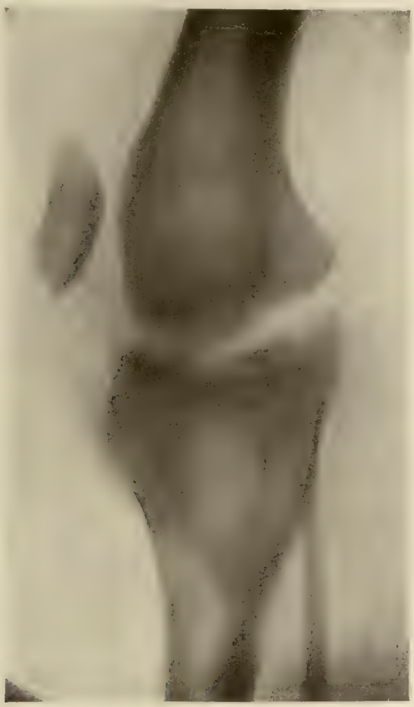

Fig. 43.—Arthroplasty for bony ankylosis, lateral view. Patella is in reversed position and entirely free from femur. Tibial edges show some lipping behind. This should be avoided by removing the bone thoroughly. The contour of the bone ends shows good adaptation and ample spacing for free motion.

weakness whatever. The boy can walk fine without crutches, although advised not to discard them for a while yet. The joint is so strong and firm that no support or bandage whatever is worn.

The patella is fairly movable, and shows no inclination to readhere to the femur. It is not unlikely that as time goes on there will be more improvement in the way of flexion, but even if such should not be the case, it can safely be asserted that the success and improvement thus far attained have justified the formidable and hazardous operation to which this patient was subjected.

CLINIC OF DR. DAVID C. STRAUS

MICHAEL REESE HOSPITAL

ACUTE ILEUS CAUSED BY THE APPENDIX ADHERENT TO THE RIGHT OVARY

Summary: Etiology, diagnosis, and treatment of mechanical ileus—differentiation from ileus of other types—cases for medical management—when surgery is indicated; operative technic—how to locate the point of obstruction—the question of drainage of obstructed loops; after-care; secondary paralytic ileus—management; frequency of ileus due to the appendix acting as the constricting agent.

May 17, 1917.

THIS patient, a Russian housewife, forty-four years of age, was brought to the hospital at 8 P. M. last night because of severe cramps in the abdomen, associated with vomiting and obstipation. The cramps began suddenly about 5 P. M. the day before yesterday, Tuesday, May 15th, and were soon followed by repeated vomiting. In all she vomited about fifteen times before her entrance into the hospital. She had her last bowel movement Monday afternoon, and this was the result of having taken Epsom salts on Sunday. Although she has been somewhat constipated for some time, there has never been anything peculiar about her stools, which have been formed and of normal caliber. Since the onset on Tuesday the cramp-like pains and vomiting have continued up to the present time. The pain has been severe all over the abdomen, though it is most severe in the epigastrium. She has had a chronic productive cough for several years, but of late she has felt as well as usual, and has not had any abdominal distress. The present acute abdominal symptoms came on suddenly, without warning. In this connection her past history is of interest.

At the age of eighteen she had a laparotomy performed to remove a tumor from the right iliac region. Subsequently a second operation was done for the same condition. Both of these operations were performed in Russia.

The patient has been at this hospital on two previous occasions. The first time was four years ago, when, in August, 1913, she entered the service of Dr. Ludwig Simon and was delivered of a normal child. This was her seventh normal pregnancy. Her previous history, recorded at that time, was entirely negative except for the two laparotomies mentioned before. The labor, which lasted one hour and forty minutes, was uneventful. No anesthesia or other medication was administered. Just following delivery the patient became markedly dyspneic and felt faint. She began to cough somewhat, but not a great deal. The cough, which she dates from this time, has never left her. During the rest of her stay in the hospital she had severe attacks of dyspnea, with profuse sweating, and was quite weak. A von Pirquet test was made and gave a positive reaction in twelve hours. Dr. Joseph C. Friedman saw the patient in consultation, and made a diagnosis of pulmonary tuberculosis. When she was discharged from the hospital in September she was advised to wean the baby because of her pulmonary disease.

She was not seen again until eighteen months later, when she re-entered the hospital in January, 1915, on the service of Dr. Lester E. Frankenthal, because of pain in the lower abdomen that had begun eight weeks before, and dated from the time of her last menstrual period. Her menstrual history was otherwise normal. She also complained of a chronic productive cough. This she dated from the time of her last pregnancy, as mentioned before. There had been no hemoptysis. She gave a history of a slight evening rise in temperature, night-sweats, and loss of appetite, but she did not believe she had lost weight.

Examination showed that the patient was two months pregnant, but nothing abnormal in the abdomen or pelvis. Dr. Friedman was asked to examine the patient in regard to her lung condition, and he made a diagnosis of fibroid phthisis. There was dulness over both apices and over the upper portion of the right lower lobe, posteriorly. There were crepitant and subcrepitant râles over these areas of dulness. The sputum was examined repeatedly, but no tubercle bacilli were found; only pneumococci, staphylococci, and streptococci.

As you no doubt well know, pulmonary tuberculosis is aggravated by pregnancy, and if active, is therefore an indication for the induction of therapeutic abortion and the prevention of subsequent pregnancies. On this indication, Dr. Frankenthal emptied the uterus and, in addition, through a low, abdominal incision, ligated the fallopian tubes. The operative record shows that on January 23, 1915, under gas-ether anesthesia, a low median abdominal section was made and the fallopian tubes were exposed and both treated in the following manner: After doubly ligating the tube a short distance from the cornu of the uterus the tube was divided between the two ligatures, the layers of the broad ligament separated, and the proximal end of the divided tube was buried in the broad ligament, and covered over by peritoneum. The abdomen was then closed. Finally the uterus was curetted and the cavity irrigated with ½ per cent. tincture of iodin. Histologic examination of the tissue from the curetage showed this to be decidual and placental tissue. The patient made an uneventful recovery and was discharged at the end of three weeks.

Since her discharge from the hospital in February, 1915, nothing further has been seen of the patient until last night, when, at 8 P. M., she was admitted to the medical service of Dr. Friedman, with the typical history and symptoms of ileus as mentioned in the beginning of the history.

Examination showed her to be a rather emaciated woman, suffering great abdominal pain, and apparently very ill. Her cheeks were flushed and her expression anxious. Otherwise examination of the head and neck showed nothing of interest. Examination of the chest showed impaired resonance and harsh breath sounds over both apices and over the upper portion of the right lower lobe, posteriorly, but no râles. The heart was normal. The abdomen was somewhat distended and meteoristic. In the right lower quadrant there was considerable bulging in the long, wide, but rather shallow incisional hernia, which has developed in the scar of one of the old laparotomies for the tumor in the iliac region. The picture was as you see it now, only with this difference. At that time visible peristaltic waves could be seen to pass from left to right across this prominent bulging in the right lower quadrant of the abdomen. The abdomen was diffusely tender on pressure throughout, but there was no rigidity. No abdominal tumor was palpable. Examination of the nervous system was negative. The temperature was 101.2° F., pulse 104, and respirations 24.

A diagnosis of ileus was made, and she was at once given a soapsuds enema. This was expelled clear, without any fecal matter. Later in the evening she was given $\frac{1}{75}$ grain of atropin, hypodermically. During the evening she vomited a foul-smelling fluid, which was described as being fecal in character. At 10 o'clock she was given a milk-and-molasses enema. This also was expelled clear, though some flatus was passed. At midnight the temperature was 100.8° F. rectally, pulse 104, and respirations 24. The patient slept fairly well during the night. At 2 A. M. she received a second hypodermic of atropin (gr. $\frac{1}{75}$). Early in the morning she was given a second milk-and-molasses enema. This again was expelled with a small amount of flatus, but no bowel movement. She continued to vomit. The leukocyte count was 12,000. The blood-pressure was 115 systolic and 72 diastolic. A morning specimen of urine showed an acid reaction; a trace of albumin; no sugar, casts, or acetone; 15 to 20 white blood-corpuscles and 3 to 6 red blood-corpuscles to the high-power field.

At 9 A. M. Dr. Friedman examined the patient fluoroscopically, but without introducing any bismuth. This seemed to confirm the clinical findings—that the obstruction was probably in the lower ileum—but the examination was not entirely satisfactory. However, as Dr. Friedman believed there was no question but that the patient was suffering from ileus, and that this required surgical care, he transferred the patient to the surgical department.

When I first saw the patient at 9.30 this morning the findings were about the same as those described in the record of the medical department, except that visible peristalsis was no longer to be made out. That the patient was suffering from ileus was beyond question. The fact that visible peristalsis had been seen in the right lower quadrant of the abdomen shows that the obstruction must be below this point; that is, either in the lower ileum or in the large intestine. In order to rule out the possibility of the obstruction being due to a malignant neoplasm of the large intestine I carefully questioned the patient in regard to the frequency and nature of her bowel movements. From her statements it was clear that she had been more or less constipated for some tine, but this had not been progressive, and had not increased of late, and her stools were formed and of normal caliber. She was positive in her statements that she had not had the narrow lead-pencil-like stools so suggestive of organic obstruction due to annular carcinoma.

In order absolutely to exclude the possibility of the obstruction being in the large intestine I have just examined the patient fluoroscopically, giving her a bismuth enema, and watching the enema enter the colon. The bismuth was seen to pass through the entire large intestine as far as the ileocecal valve without meeting any obstruction and without showing the presence of any filling defect. This shows that there is no obstruction in the large intestine, and, therefore, by exclusion, the obstruction must be in the small intestine.

Having determined this, I was particularly interested to learn where her pain was most severe, and I have just questioned her carefully in regard to this. She insists that the pain is most severe in the midepigastrium, though she says it is almost as severe all over her abdomen. It is not more severe on the right side than on the left, and is not as severe in the right lower quadrant as it is in the epigastrium.

In ileus the site of the obstruction cannot at all be determined by the area in which the pain is felt. In obstruction located in the small intestine the pain is usually most severe in the region about the umbilicus, and also often in the epigastrium, as in this case. Even when definite unilateral distention and local meteorism is present, as in this case, it is only rarely that the pain is localized on the affected side, and is unilateral. In ileus of the large intestine the location of the pain varies, depending upon the portion of the gut that is distended. If the transverse colon is distended, most of the pain is localized in the upper abdomen. When the obstruction is in the lower part of the descending colon, the pain is located in the left side of the abdomen. When the sigmoid is distended, the pain is usually similar to the pain due to obstruction in the small intestine, and is similarly referred to the region of the umbilicus or in the small of the back.

Having satisfied ourselves that the patient is suffering from an obstruction in the small intestine, it still remains to determine whether the obstruction is *mechanical*, or whether it is due to a *localized spasm* or to a more or less localized *paralysis* of this portion of the gut, *i. e.*, whether the patient is suffering from mechanical ileus, dynamic ileus, or adynamic ileus.

When we consider that the patient has had three laparotomies, and therefore probably has adhesions, and when we consider further that her symptoms came on suddenly and followed the use of a drastic cathartic, which, by setting up violent peristalsis, causes various loops of bowel to change their position more or less, it is logical to suspect that we have to do with a mechanical type of ileus caused by an adhesion.

We must, of course, consider all the other causes and varieties of ileus in order to exclude them. In order to do this systematically it is well to have some classification in mind, though it is needless to say that there may be a combination of causes in any given case, and no classification has yet been suggested which is beyond criticism. Some classification such as the following, which is a combination of several which have been proposed, is useful for clinical purposes:

ILEUS—VARIETIES AND ETIOLOGY

MECHANICAL

A. *Strangulation.*[1]

1. All varieties of external strangulated herniæ:
    - Femoral.
    - Inguinal.
    - Umbilical.
    - Ventral.
    - Obturator.
    - Ischiadic.
    - Perineal.
    - Lumbar.
    - Vaginal.
2. Internal herniæ:
    - (*a*) Into the various peritoneal pockets:
        - Fossa duodenojejunalis.
        - Parajejunal.
        - Fossa cæcalis inferior.
        - Fossa cæcalis and subcæcalis.
        - Hernia into the Douglas pouch.
        - Hernia retroperitonealis anterior.
        - Intersigmoid hernia.
    - (*b*) Through the foramen of Winslow.
    - (*c*) Diaphragmatic hernia.
    - (*d*) Apertures:
        - Congenital or acquired slits (operations) in the mesentery, omentum, broad ligaments, etc.
3. Adhesions and bands.
4. Diverticula. Meckel's diverticulum.

B. *Angulation.*

- Adhesions.
- Bands.
- Operations.

FUNCTIONAL.

Aperistaltic (Adynamic; paralytic).

1. General or local peritonitis.
2. Embolism and thrombosis of superior mesenteric vessels.
3. Uremia.
4. Chronic drug poisoning.
5. Reflex ileus.
    - Torsion of mesentery.
    - Torsion of pedunculated tumors.
    - Pancreatitis.
    - Extraperitoneal abcess.
    - Intra-abdominal hemorrhage.
    - Ulcerative enteritis.
    - Strangulation of omentum.
    - Ovary or testicle.
    - Hepatic colic.
    - Renal or ureteral colic.
    - Trauma.
    - Ovarian compression.
    - Diaphragmatic pleurisy.
6. Operations on mesentery.
7. Spinal cord lesions.
8. Afferent nerve lesion.
9. Prolonged mechanical ileus.

Hyperperistaltic (Dynamic; spastic).

1. Lead-poisoning.
2. Tyrotoxicon poisoning (ptomain poisoning due to stale milk, cheese, or ice cream).
3. Hysteria.

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[1] In this classification the term is used in the broad sense and not in the strict pathologic sense, although many of these cases do go on to strangulation in the strict pathologic sense. This is one of the objections to this classification.

ILEUS—VARIETIES AND ETIOLOGY

MECHANICAL	FUNCTIONAL
C. *Compression.*	
Neoplasms (extrinsic).	
Displaced organs.	
Superior mesenteric vessels.	
Inflammatory and other exudates.	
Foreign bodies.	
D. *Obturation.*	
Strictures from cicatrix.	
Neoplasms (intrinsic).	
Foreign bodies.	
Gall-stones.	
Fecal impaction.	
Worms.	
E. *Intussusception.*	
F. *Volvulus.*	

There is nothing in the history or the physical findings to make us believe that we have to do with a hyperperistaltic (dynamic, spastic) type of ileus, for there is no evidence of lead-poisoning, and the negative history and the fact that the patient so completely purged herself just before the onset of the ileus rules out tyrotoxicon poisoning.

The fact that visible peristalsis was to be seen when the patient first entered the hospital would lead one to believe that the original cause of the ileus was some mechanical obstruction rather than a more or less localized absence of peristalsis such as occurs and is the cause of the obstruction in the aperistaltic (adynamic, paralytic) type of ileus. However, the fact that visible peristalsis was present does not necessarily rule out paralytic ileus, for in cases of paralytic ileus there may be increased peristalsis in the loops just proximal to the area paralyzed. Furthermore, an ileus, primarily paralytic, may be complicated by angulation with resulting mechanical ileus—*i. e.*, combination forms occur. There is, however, in this case nothing in the history or the findings that suggests any of the conditions that cause aperistaltic (adynamic, paralytic) ileus, all of which I have carefully considered.

There are certain peculiarities in the symptoms occurring in mechanical ileus which are often of aid in making the differential diagnosis between mechanical ileus and the other two forms.

In mechanical ileus there is always pain, and this is characteristically recurrent and colicky in type. This is soon accompanied by vomiting. The vomiting in mechanical ileus tends to increase, both in frequency and particularly in amount, the longer the obstruction continues, because the vomiting is due to the stagnation and backing up of fluids and food ingested, mixed with the intestinal and gastric secretions. In the other two varieties of ileus the vomiting, in general, tends to diminish the longer the time from the onset. This is explained by the fact that in functional ileus the vomiting is largely reflex in nature, and tends to diminish progressively.

In mechanical ileus, when the obstruction is low down, the amount of fluid vomited is sometimes enormous. In general, the lower down the obstruction, the greater the amount of fluid vomited. The higher the site of the obstruction, the less is the amount vomited, and one must not forget that in case the obstruction is near the stomach, as in gastromesenteric ileus, the amount of fluid vomited may be very small, although it is characteristic in that it consists of practically nothing but gastric secretion.

In an uncomplicated case of mechanical ileus fever is never present primarily. As a general rule, the presence of fever and leukocytosis speaks against mechanical obstruction and suggests some other cause for the ileus, usually some inflammatory condition in the abdomen, associated with peritonitis, or some inflammatory condition associated with reflex ileus. This is a very important point in diagnosis, and one that should never be forgotten.

One occasionally meets with a case of mechanical ileus in which a careful history and physical examination will disclose the fact that the patient has some associated or complicating condition present. For example, in this case the fever and leukocytosis can be easily accounted for by the lung findings. Of course this does not rule out the possibility that the ileus may be due to some inflammatory condition in the abdomen, but there is nothing in her history to make one suspect local or general peritonitis.

Considering all these facts, which suggest that the ileus is mechanical, and in view of the absence of anything in the history or findings which would suggest that the ileus is due to any of the conditions which produce functional ileus, *i. e.*, aperistaltic (adynamic, paralytic) or hyperperistaltic (dynamic, spastic) ileus, and since medical treatment has given no relief, I feel that operative interference is indicated.

Let us briefly recapitulate the evidence we have that suggests that the ileus is mechanical. The fact that the patient has undergone three laparotomies makes it probable that she has some adhesions. Except for her lung condition, with its chronic productive cough, she has been perfectly well up to the moment of the sudden onset of the severe colicky pain. Her vomiting followed this. The absence of any previous abdominal pain, vomiting, or any history of renal colic, gall-stone colic, or the like is striking. The fact that the vomiting since its onset has been progressively increasing is significant, as is also the fact that visible peristalsis has been present. Finally, the failure of thorough medical treatment, added to all the other evidence, makes the indication for surgery absolute. While it is impossible to say positively that the obstruction is mechanical, the great probability is that such is the case.

Considering the various possibilities as to the nature of the mechanical obstruction, we can only say that no external herniæ are to be made out except the incisional hernia. This is so broad that it seems improbable that it is the cause of the obstruction. The presence or absence of the various other conditions which come into consideration can only be determined at our exploratory operation.

Now that the patient is anesthetized, we will proceed to the operation. Just before starting the anesthetic in these cases it is advisable to empty the patient's stomach thoroughly by means of the stomach-tube, for in case this is not done, as soon as he is completely under the anesthetic and the sphincters relax, the patient is very apt to vomit a large amount of fluid and aspirate this, with the result that he "drowns in his own vomitus." To further guard against this I am taking the additional precaution to slightly elevate the foot of the table. This will also facilitate the operation. You will note the median scar through which the tubes were ligated two years ago, and also these two scars on the right side from the old operations for the removal of the tumor. This bulging on the right side is due to the distention of the gut protruding through the incisional hernia.

Operation.—We might open the abdomen through the incisional hernia so that we could repair the hernia after dealing with the ileus, but with a patient suffering from ileus, even of short duration, it would be poor judgment to subject the patient to the additional time on the operating table that this would necessitate, and so we shall not attempt to do anything with the hernia today. Irrespective of the ileus, one would not attempt a radical cure of a hernia while a patient has a chronic cough unless there were some special indication. Furthermore, it is impossible to know beforehand just where the obstruction is located, and for this reason it is best to make a median incision. As I am quite sure that the site of the obstruction is in the lower abdomen, I am making my incision from just below the umbilicus downward toward the symphysis. Through this incision an obstruction in any part of the abdomen can be thoroughly dealt with, and this is a good incision in all cases where the site of the obstruction is in doubt. It is essential to have ample exposure so that the operative work can be done quickly and the abdomen can be explored thoroughly.

Now that I have cut through the skin and subcutaneous fat, only the linea alba and peritoneum remain to be divided. We are in the peritoneal cavity. These red, distended loops of bowel that present themselves in the wound are greatly distended loops of small bowel. Although they have the caliber of large intestine one can tell that they are small intestine from the fact that they have no tinea, show no haustræ, and possess no appendices epiploicæ. The very bright red color of these distended loops shows that, due to the interference with the circulation and the prolonged stasis of the fecal stream, they are greatly inflamed, *i. e.*, a moderate peritonitis is already present. There is no free fluid in the peritoneal cavity, however. You see these distended coils show no peristalsis. In other words, an adynamic or paralytic ileus has taken place due to the prolonged duration of the obstruction. This, of course, must be located below this portion of the bowel, for, as you know, the portion of the bowel below the site of obstruction becomes collapsed, whereas the portion of the bowel just above the obstruction becomes more and more distended. At first the musculature makes abnormally forcible efforts to overcome the obstruction. Later, however, due to overactivity the muscle becomes paretic and finally paralytic, and the distention then increases.

As we know that the obstruction must be lower down, and is not in the large intestine, I shall at once try to locate the ileocecal valve, and beginning at this point shall follow the ileum upward until I come to the point of obstruction. In cases where the site of obstruction has not been determined, one should work systematically. One of the best methods of procedure is to locate the cecum and determine whether or not this is distended. In case the cecum is distended, it is evident that the obstruction must be somewhere lower in the large intestine. If, however, the cecum is not distended, the obstruction must be somewhere higher, and must, therefore, be in the small intestine. Beginning at the ileocecal valve one proceeds to follow up the collapsed small intestine until the point of obstruction is met with. Above this point the bowel will be distended. It is often imprudent, however, to follow this procedure, for on opening the abdomen the distended loops so frequently present themselves, and if one should attempt to palpate the cecum there might be danger of rupturing these greatly distended loops. In such a case one attempts to find a collapsed loop of bowel, and to trace its mesentery back to its origin from the spine, in order thus to determine which is the right side or upper surface of the mesentery and which is the left or lower surface. Having determined this, if one proceeds to follow the loop to the left and upward, he will come upon the site of obstruction, which must be proximal to the collapsed portion of the bowel. In this case I do not readily find any collapsed loop, and so shall follow the distended loop downward and to the right. I shall replace these distended loops of small bowel as I proceed in my search, for one should not eviscerate a patient. I am now almost down to the cecum. Low down in the right iliac fossa I am quite sure I feel a band that seems to be the cause of the obstruction. I shall try to show it

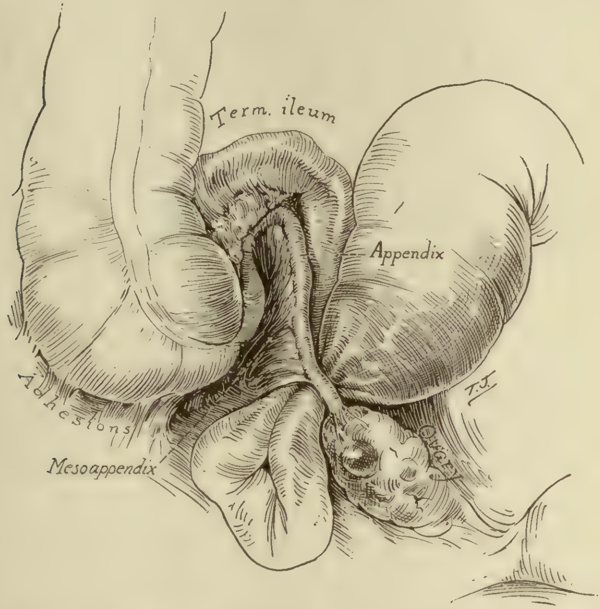

Fig. 44.—Drawing of the manner in which the appendix, adherent by its tip to the cystic right ovary, acted as the strangulating band, constricting the loop of ileum which has slipped behind it. As can be seen, the obstruction was caused by the loop being held against the posterior parietal peritoneum by the free portion of the appendix in front, the free margin of the meso-appendix above, and the cystic right ovary below.

to you. Yes, I am sure *I have found the cause of the trouble.* Now you can see it. You see *it is the appendix, the tip of which is adherent to the right ovary* (Fig. 44). The bowel above this area of constriction is distended, while you see that the portion below the area of constriction is collapsed. It is now clear why I could not find any collapsed loop earlier. You see that the obstruction is a very short distance from the ileocecal valve,

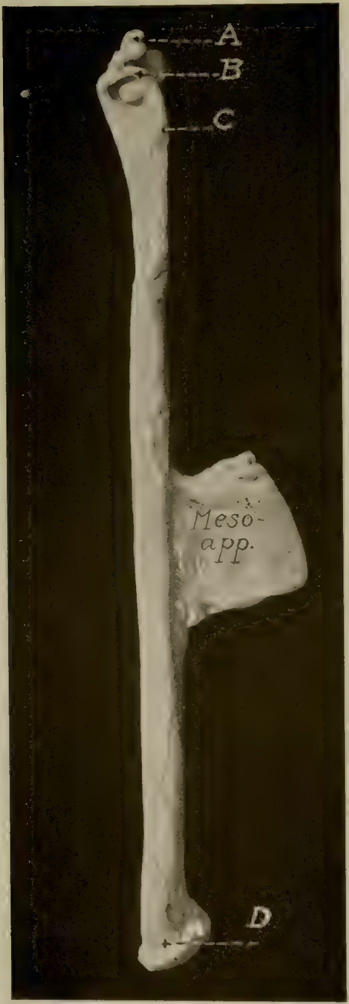

Fig. 45.—Photograph of appendix (natural size). Note the strong, broad adhesions that bound the tip of the appendix to the ovary (*A*). The tip of the appendix can be plainly made out (*B*), as can also the distal point of insertion of the meso-appendix (*C*). The portion of meso-appendix cut away is seen at the center of the appendix. The site where the appendix was clamped is also plainly to be seen (*D*).

that only a single loop of gut has been constricted, the point of obstruction being about 15 inches from the ileocecal valve.

The ovary is greatly enlarged and is cystic. You see how thoroughly this loop is constricted, being held against the posterior parietal peritoneum by the appendix in front, the free margin of the meso-appendix above, and the diseased ovary below. As we have now already examined the entire small intestine, and as our fluoroscopic examination showed no obstruction in the large intestine, we are sure there is no second point of obstruction and can dismiss this possibility. One must never fail to remember that there may be more than one point of obstruction. I am now clamping and dividing the meso-appendix, beginning near the tip, just as one does in any ordinary appendectomy. Now that I have partially divided the meso-appendix, I can slip my index-finger under the appendix, between it and the constricted portion of the gut. Now the gas in the distended portion passes downward into the collapsed portion and fills this out. There is no peristalsis, however. The fact that there is no peristalsis is of bad prognostic import, for even though the original cause of the ileus will be overcome as soon as the appendix is removed, the patient may still die from ileus—*i. e.*, paralytic ileus. The distended portion of the intestine contains practically nothing but gas. This is explained by the fact that the patient had so thoroughly purged herself just before the onset of the ileus. No operation for ileus is properly completed if the patient leaves the table with the abdomen greatly distended. Now that the strangulation has been relieved, by gentle pressure I am forcing a considerable amount of this gas downward. It is a question whether I should allow this air to escape by making a small incision in the distended gut or by inserting a needle. This should always be done in case there is much fluid and gas in the distended portion of the bowel. It seems hardly necessary, however, in this case.

I am now completing the division of the meso-appendix. This is an unusually long appendix, measuring somewhat over 5 inches. You see the appendix extends almost vertically upward from the ovary, to which the tip is still adherent, passes over the constricted loop of gut, continues vertically upward for some distance, finally to arch laterally toward the medial surface of the cecum, which it then follows downward in a vertical direction to its usual site of origin. Now it is free except at its origin from the cecum and at its tip, where it is still adherent to the ovary. I am now separating it from the ovary. It is now free from the ovary, and it only remains to remove it in the usual manner—*i. e.*, to complete the appendectomy. I introduce a purse-string of black waxed silk into the wall of the cecum about the base of the appendix, now apply two Kocher artery forceps near the base, remove the proximal clamp, and ligate the base with a fine black waxed silk ligature in the groove crushed by the proximal clamp just removed. Now with the scalpel I amputate the appendix between the ligature and the distal clamp. We now treat the stump with phenol followed by alcohol, invaginate the stump, and bury it by tying the purse-string. There are a few old adhesions between the terminal ileum and the parietal peritoneum. These I doubly ligate and divide. The cecum is still firmly bound to the parietal peritoneum by old adhesions, but I shall not disturb these (Fig. 44). It would be easy to remove the diseased right ovary, but the patient's grave condition does not warrant even this short additional delay and trauma. If the patient recovers I shall repair the ventral hernia at some future time after her cough has been controlled, and through this incision I shall remove this right ovary. As there is no free fluid in the peritoneal cavity I shall not drain. A drainage-tube would have nothing to drain away, and might lead infection into the peritoneal cavity from without. Drainage is not usually necessary in these cases. I am, therefore, closing the abdomen completely, using a running plain catgut stitch for the peritoneum, which I am closing separately. I am now closing the fascia with a continuous locked No. 2 chromic catgut suture. I close the skin with a running black waxed silk suture No. 3. The patient is in fairly good condition. She will now be returned to bed and we shall have the head of the bed raised. As soon as she comes out from the anesthetic she will be given a "shock enema." This consists of 8 ounces of black coffee with $\frac{1}{2}$ ounce of brandy. This will be repeated every four hours till three have been given. We shall then give her proctoclysis, allowing the solution to flow for two hours, then interrupting the flow for two hours, and then re-establishing the flow for a second period and continuing in this manner as long as may be desirable. As a solution I like 4 per cent. glucose in tap-water. This not only supplies nourishment, but is also an easily absorbable carbohydrate which I believe is of value in combating the acidosis which is very apt to develop in a patient with ileus. This proctoclysis will be continued until the patient can take fluid by mouth without vomiting. She will be given a 1-1-1 enema (1 ounce of Epsom salts, 1 ounce of glycerin, and 1 ounce of water) every morning for three or four days, after which time she will be given a laxative by mouth if any is needed.

The after-treatment of this case will be of particular interest and importance because of the adynamic ileus that developed as a result of the long duration of the mechanical ileus. For the same reason the prognosis is unusually bad.

Postoperative Course and Treatment (May 17, 1917).—When the patient was returned to bed her pulse was 136 and respirations 28. The pulse was of fairly good quality. The postoperative treatment mentioned above was carried out on the first day. She only vomited once that day after the operation. Water was given in 1-dram doses, beginning five hours after the operation, and she had taken 8 ounces by midnight and did not vomit after this had been begun. The pulse varied from 120 to 140 during the day. At 4 P. M. rectal temperature was 103.6° F. and remained at this height until midnight. The temperature having risen to this height so soon after the operation could not have been due to infection from the operation, but was probably due to an aggravation of her pulmonary trouble.

By midnight she had urinated twice, passing 9 ounces in all. At midnight, the patient having been quite restless for several hours, the intern ordered morphin sulphate ($\frac{1}{6}$ gr. hypodermically). This was repeated again at 4 A. M. If an anodyne is required in these cases I usually prefer heroin (gr. $\frac{1}{6}$).

May 18, 1917: At 8 A. M. her temperature was 104.6° F. and pulse 132. At this time she received her first 1-1-1 enema. This was expelled, with a small amount of yellow fluid, but no real bowel movement and no flatus was expelled. When I saw her at 9 A. M. her abdomen was considerably distended, but there was no rigidity or particular tenderness. This I believed was entirely due to the paralytic ileus still continuing. I therefore ordered physostigmin (gr. $\frac{1}{60}$ hypodermically) and, in addition, strychnin (gr. $\frac{1}{30}$ hypodermically) one hour after each dose of physostigmin. I also ordered a rectal tube passed as indicated and hot turpentine stupes applied to the abdomen.

I considered using pituitrin, being familiar with the numerous recent publications on its value in paralytic ileus, especially postoperative ileus. Among these, C. L. Gibson's[1] enthusiastic clinical report advocating the use of pituitrin is of particular interest, as he is a careful observer and his judgment deserves the greatest consideration. On the other hand, the experimental evidence on the action of the various pituitary extracts upon the intestinal contractions and tonus is very conflicting, and the recent experimental investigations must receive due consideration.

Shamoff[2] found that posterior lobe extracts—various commercial as well as freshly prepared and old laboratory preparations alike—instead of uniformly stimulating the unstriped muscle of the intestine to contract, as has been commonly believed is the case, showed great variability in their actions and often produced definite and well-marked inhibition of the movements and tonus. He believes that there unquestionably exists in the posterior lobe some substance which is capable of causing relaxation of the isolated intestinal loop and inhibiting its rhythmic contractions, and that its presence or absence in the extracts may depend on their method of preparation. He concludes that more accurate studies can only be made when this is perfected or when the active principle or principles of the gland become known.

Hoskins[3] investigated the effect of intravenous injections of extracts of pituitary gland on the intact small intestine of dogs. In 5 cases out of 6 a clean-cut depression of tonus and peristalsis occurred.

Similar observations have been reported by Pancoast and Hopkins[4] in a clinical study on the effects of pituitrin in 11 patients. The action was studied by means of fluoroscopic examination after administering a contrast meal. They report that roentgen examination is an accurate means of studying certain phases of drug action upon the gastro-intestinal tract of man. While they found the effects of pituitrin were very variable, there was sufficient uniformity in their observations to draw definite conclusions. They found that in the small intestine motility was, as a rule, either not affected or slightly delayed. In the large bowel the drug produced little or no appreciable effect on motility.

As I had not had any previous experience with pituitrin in cases of paralytic ileus, I decided not to employ it in this particular case, and therefore decided to try physostigmin, although I have not much faith in it, and do not ever remember having seen any results that I felt could be attributed directly to it.

At noon her temperature was 104.4° F. and her pulse 104. As she vomited some greenish fluid at this time, which was the first time she vomited since immediately after the operation, I ordered her stomach to be washed out.

When I saw her in the evening her general condition seemed fairly good, though her abdomen was still distended as in the morning, in spite of the two doses of physostigmin, repeated use of the rectal tube, the continuous application of hot turpentine stupes, and a second 1-1-1 enema given at 5 P. M. She had had a poor day and had vomited twice during the afternoon, and had not been able to retain the little fluid by mouth. During the day the glucose solution was continued per rectum. Because of her toxic condition and the weakness of the pulse I deemed it essential for her to receive more fluid, and so had her given a hypodermoclysis of 1000 c.c. of Ringer's solution at 6 o'clock, and had this repeated at 10 P. M. Hypodermoclysis has been found of value in cases of adynamic ileus. The explanation given is that it increases the circulation and therefore aids in removing the toxins. During the day her temperature had gradually dropped and at midnight it was 101.8° F. rectally. Her pulse had also gradually come down during the day to around 120.

May 19, 1917: When I saw the patient this morning, the third day after operation, her temperature was 100.8° F. rectally and pulse 120. She had vomited twice during the night. Her abdomen was still distended, as it had been the day before. The use of the turpentine stupes, rectal tube, and stomach-tube were continued, as was also the glucose solution per rectum. The patient was given but very little water by mouth. A 1-1-1 enema given in the morning failed to cause the passage of a stool or flatus. Another one given in the afternoon resulted in the passage of some flatus, but no bowel movement.

When I saw her in the evening her temperature had risen to 102.4° F. and pulse was about the same as in the morning—120. As I was convinced that I had overcome the original cause of the ileus, I decided to give the patient a cathartic that night. I therefore ordered calomel, gr. $\frac{1}{5}$, given every half-hour for five doses. She vomited a brown offensive fluid twice during the afternoon and evening.

The morning specimen of urine showed a specific gravity of 1030, acid reaction, a trace of albumin, no sugar, acetone, or indican. The microscopic examination showed no casts and only an occasional white blood-cell. Her leukocyte count was 7000.

May 20, 1917: On the morning of the fourth day her temperature had come down to 100.4° F. and pulse 112. She had vomited once during the night, a coffee-colored fluid. As there was no result from the calomel by the time I saw the patient, I ordered milk of magnesia to be given in dram doses every three hours. An enema given in the evening was expelled with considerable flatus, but no stool. The turpentine stupes and glucose solution were continued the entire day. She spent a poor day and the distention had not decreased.

The morning specimen of urine was entirely negative. A complete white blood count was made and showed 8200 leukocytes. A differential count showed 79 polymorphonuclears, 13 small lymphocytes, 4 large lymphocytes, and 2 transitionals.

As I felt certain that I had completely overcome the obstruction, I believed the continuation of the ileus was due to the fact that the original obstruction had been present for such a long time before operation that we were now confronted with a paralytic ileus. However, I considered the possibility of having produced a volvulus in returning the distended loops of bowel into the abdomen, but as I had exercised great care in doing this, I felt satisfied that such a complication had not occurred. I had considered the wisdom of re-opening the abdomen on Saturday to exclude the possibility of a volvulus, but decided I was probably confronted with a paralytic ileus only, and as the pulse and temperature had come down gradually and the leukocyte count was only 7000, it was safe to wait to see the results of the cathartics given by mouth.

By midnight she had received four doses of milk of magnesia. During the night this was continued every three hours also.

May 21, 1917: The next day the same treatment was continued, except that 20 per cent. brandy was added to the glucose solution, in order to increase the amount of stimulation and nourishment. From 1 to 3 P. M. she received 28 ounces; from 5 to 7, 30 ounces; from 9 to 11 and from 1 to 3, a total of 30 ounces; and from 5 to 7, 25 ounces. This was a total of 113 ounces by proctoclysis—20 per cent. of this being brandy, she had received 22⅗ ounces of brandy.

During the day her temperature varied from 100° to 101.4° F. rectally. Her pulse varied from 100 to 112. Her morning 1-1-1 enema was expelled with considerable flatus, but no formed stool. An enema given late in the afternoon was expelled with considerable flatus and a few feces. She spent a fairly good day and only vomited once, some greenish fluid—no longer any brownish foul material. At 9 P. M. she spontaneously passed a large liquid stool with small particles of feces. She spent a fair night.

May 22, 1917: On the morning of the sixth day following her 1-1-1 enema she passed a large formed stool. Following this the distention completely disappeared. She was now given a light soft diet.

From this time on she made an uneventful recovery as far as her ileus was concerned. Her lung condition, however, continued to annoy her, and she has run more or less temperature ever since, and the condition has not improved now in months. Indeed, it seems to have progressed somewhat.

Unfortunately, due to her constant uncontrollable coughing, a hernia has developed in the recent operative scar, but this is only what was anticipated as unavoidable in such a case.

Meissner[5] in a recent article reports a case of strangulation ileus caused by the appendix acting as a constricting band. The patient gave a typical history of appendicitis, and at operation the tip of the appendix was found adherent to the anterior abdominal wall three fingerbreadths below the umbilicus and about three fingerbreadths to the right of the median line. The tip only was adherent and the body of the appendix acted as a constricting band, strangulating a loop of small bowel which lay wedged in between the appendix and the anterior surface of the cecum.

He ends his article with the statement that he is not familiar with a single similar case, and, therefore, believes this interesting kind of strangulation ileus, caused by the adherent vermiform appendix, ought to be reported. It is surprising that a German surgeon should be so unfamiliar with the available German literature, for perhaps the most comprehensive monograph on ileus is that of Wilms.[6]

Wilms[7] quotes Hilgenreimer's statistics on the frequency of strangulation ileus due to bands, omentum, diverticula, etc. *Hilgenreimer found that of 298 cases of strangulation ileus due to such causes, the appendix acted as the constricting band in 34.*

In addition, Wilms gives a list of cases reported in the American, English, French, and German literature in which the appendix acted as the constricting band.

In conclusion it may be of interest to know that Wilms[8] points out that *of all the organs, the appendix is the one, which on account of its adhesions, gives rise to strangulation ileus most frequently.* Similarly, Sprengel,[9] in his monograph on Appendicitis, in connection with his chapter on intestinal obstruction in relation to appendicitis, appends a list of cases in which the appendix itself acted as the constricting band. The appendix may become adherent to the mesentery, to the lower ileum, to the cecum, in the right iliac fossa, in the region of the rim of the pelvis, in the true pelvis, to the rectum, to the bladder, to the right ovary (as in this case), or even to the descending colon.

Cases of strangulation caused by the right fallopian tube becoming adherent to the right iliac fossa are more rare.

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CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

CONSERVATIVE SURGERY IN CHILDREN

Summary: Local resection and open treatment *versus* amputation in the management of injuries and infections of the extremities; demonstration of a case of pyogenic infection of the ankle-joint with necrosis of entire tarsus successfully treated without amputation.

THE case of this boy is illustrative of the necessity of conservative surgery in children. Of course, conservative surgery is not limited to children and should be practised on the adult as well. This war is certainly teaching great lessons in this respect. With the large losses of extremities and injuries to the body, and large numbers of men incapacitated, the question of conservatism has entered very strongly into the consideration of operative procedure in cases of injuries. But not alone injuries, also other pathologic conditions require conservatism. It is a fact that radicalism in surgery is compatible with conservatism, notwithstanding that both represent two entirely opposite principles. To strike just the happy medium is the most important factor and is determined by the surgical tact and experience of the operator. When we had to deal, for instance, with a tuberculous process resulting in the destruction of all the small bones of the wrist, marked edema of the hand, and with tubercular masses and granulations, perhaps several fistulæ, in the skin above the lesion, we used to believe that we had an absolute indication for amputation above the seat of the tuberculosis. This left, of course, a stump-arm. It seemed pitiful to sacrifice the healthy fingers and thumb with their great possibilities of usefulness just because the intermediate portion between the healthy hand and the forearm above the diseased wrist was so far advanced in destruction, and still no conservative measures seemed to be at all successful.

Resections of the diseased tissues have been tried many times, but blood-vessels and nerves had to be sacrificed to such an extent that either a limp hand, which could be made of no functional use, or necrosis of the entire hand, was the result, and consequently the procedure was thought of no avail. The same applied to disease of the hip or knee if the resection had to be made so extensive that blood-vessels and nerves had to be sacrificed, it was thought that there remained nothing but amputation above the seat of the lesion.

During the last few years we have learned, through the treatment with bismuth injections, through the treatment with *x*-ray and blue light, to improve these conditions of tuberculosis to such an extent that we often transform diseased bones and soft tissues into cicatricial and still useful bridges between the healthy fingers and the healthy forearm. The same principle applies to knee-joint and ankle-joint affections.

The radical surgeon who amputates obtains a speedy recovery of the patient, of course, but with a badly mutilated arm or leg. I have repeatedly seen examples of such radicalism, which seemed to me to represent much unnecessary sacrifice, and it has always been my endeavor to be as conservative as possible before giving up an arm or foot to amputation. In children especially this principle should prevail, since there is a most remarkable possibility of reconstruction by nature.

As an example of conservative surgery in children, I present to you this boy. Master D. S., aged ten, was brought to me by his parents after he had been under treatment by one of our good local surgeons for several weeks. As this surgeon told me, the boy came to him with a septic infection localizing itself in joints of the elbows and one foot. The elbow infection was not of such a stormy character as that of the foot, where suppuration took place within the small bones, destroying portions of them, invading the tendon sheath, and causing local destruction. Fistulæ necessitated incisions in different directions, the introduction of tubes for drainage, etc. Nevertheless the fever kept up until the day he came to me, after consulting several surgeons who had advised amputation of the foot. The father was very reluctant to sacrifice the foot of this boy and decided to change surgeons. I mention this fact because it shows the necessity of the publication of articles to preach conservatism, since in this case the decision of very good men, who were called in consultation, was that the case was beyond recovery (Fig. 46).

It occurred to me after examination with the *x*-ray that the infection, which still caused considerable fever, could be exterminated by making extensive resection of the bones forming the foot, leaving the skin and underlying connective tissue as a sort of shell, and wherever it was possible leaving a trace of the periosteum for future bone formation. This might also enable us to avoid amputation.

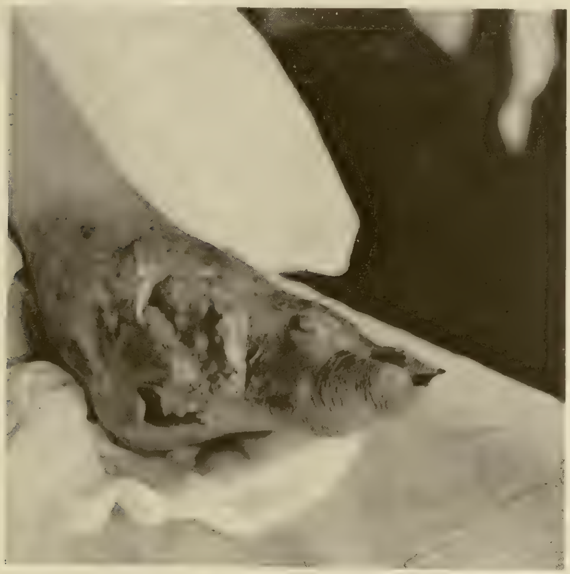

Fig. 46.—The foot as it came under our observation before treatment, showing incisions in different places with protruding granulations. The incisions were made evidently so as to avoid the large vessels. There are counterincisions on the opposite side of the foot. Tubes were in these incisions when the patient came to us.

According to this plan, the foot was opened extensively and all the necrotic bones were removed, leaving periosteum wherever it was not detached or necrotic (Fig. 47). The cavity, which had a counteropening on the opposite side of the foot, was quite extensive. Nothing was left of the astragalus, of the calcaneus, of the cuneiform bones, and even the adjoining parts of the metatarsal bones were removed (Fig. 48). The greater portion of the metatarsal bones and phalanges were left, however, since they did not seem to be involved. The tendons, as far as they had not been destroyed, the blood-vessels, the dorsal artery, and the external and internal malleolar arteries were left, so that there was good circulation. The whole cavity was packed tightly with gauze and left for granulation (Fig. 49). A few days later the foot was put into a permanent bath and the liquid changed very often. Rapid granulation followed, filling out the cavity, and inside of a few weeks it seemed as if that whole cavity, which had been the size of a small fist, was filled out completely with a granuloma (Fig. 50). The skin wound closed and the foot,

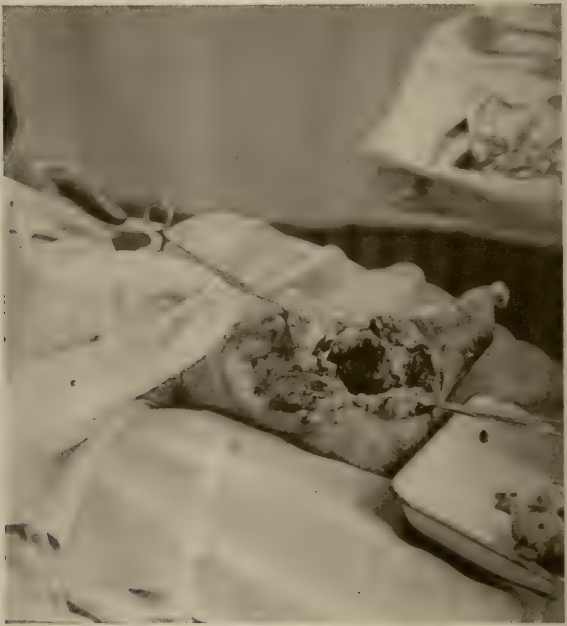

Fig. 47.—Our operation: opening the foot by joining the two medial incisions. Note the extent of the cavity. In a basin near by are the bones which have just been removed.

somewhat edematous, but otherwise in the same shape as before, was retained.

The boy began to hobble around on crutches. Fever disappeared and he gained in weight and spirits. Function of the foot was at this time not present, inasmuch as it was very heavy and still considerably painful, especially at night. There was no discharge from anywhere and it seemed that, as far as surgical results were concerned, the foot, although painful at night, was closed. An *x*-ray picture taken a few weeks afterward showed there was some re-formation of bones, calcareous deposits being visible in places where there had been no bone before (Figs. 51 and 52).

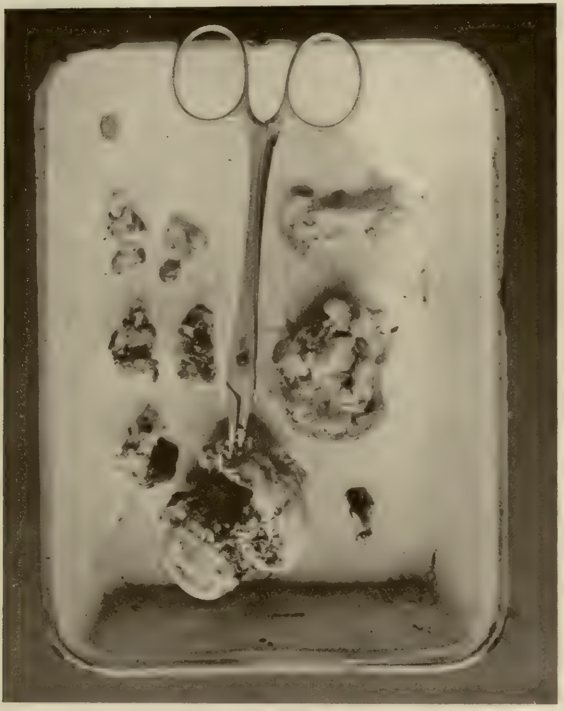

Fig. 48.—Showing the calcaneus, astragalus, cuneiform, and the sequestra of other bones removed from the cavity.

The pains continued, however, and several months afterward

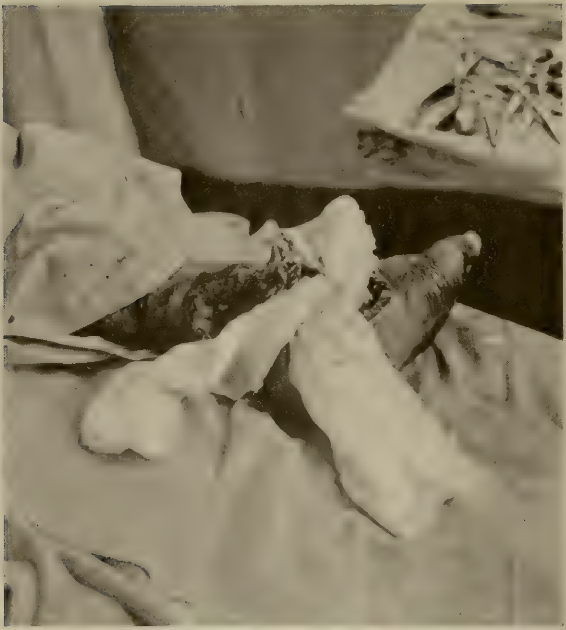

Fig. 49.—The cavity packed with three large strips of gauze.

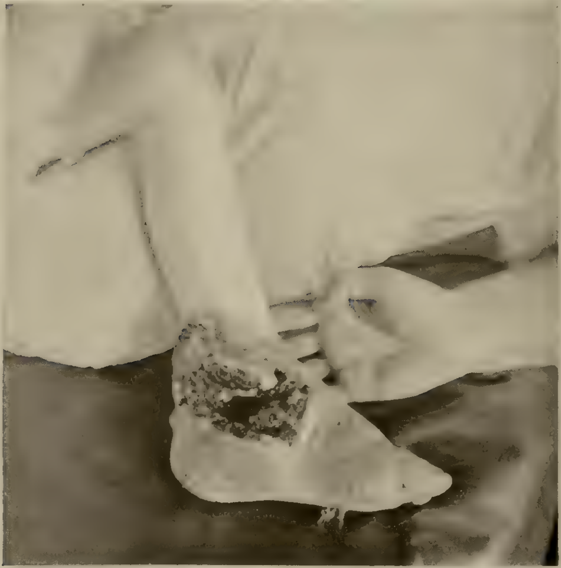

Fig. 50.—Two weeks later—the huge cavity has been almost obliterated by granulations.

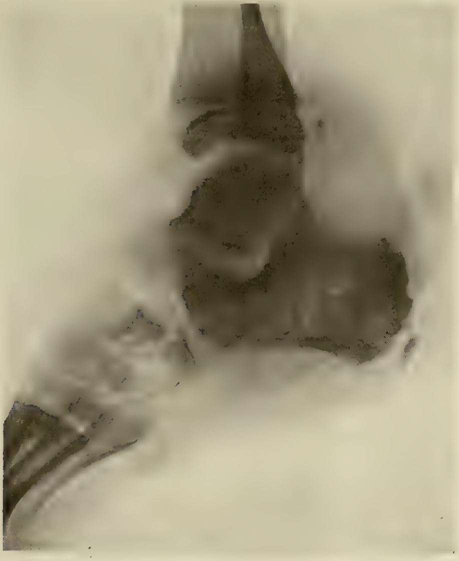

Fig. 51.—Skiagraph of the foot before operation.

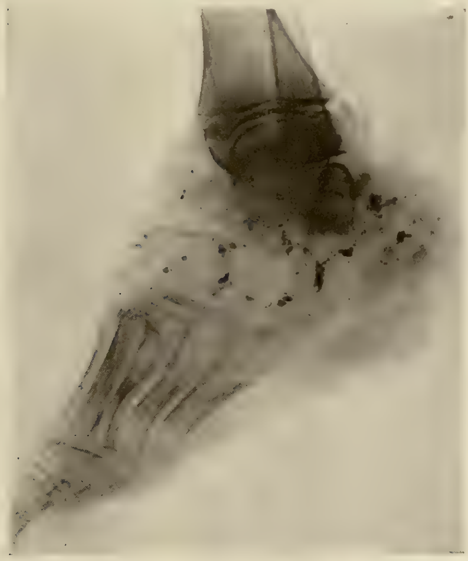

Fig. 52.—Six weeks after operation. The dark splotches represent remnants of bismuth paste. Note areas of calcification in region formerly occupied by tarsal bones.

it was suggested that the continuous pain might be due to some inflammatory condition, although not to suppurative changes, of some of the cartilages of the joint and of the metatarsal bone, particularly that of the large toe. It was decided, therefore, to eradicate the diseased portions of these bones and also the newly formed bone, so as to give the foot another chance to form better and less inflamed bone. This time the operation was performed by Dr. Emil Beck in my absence, was very successful, and the foot now is healed absolutely without pain. A plaster-of-Paris

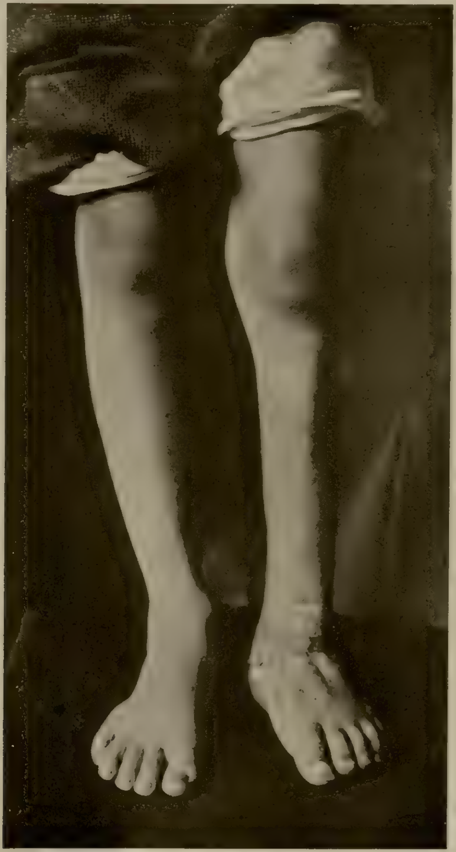

Fig. 53.—Patient perfectly cured, standing on his foot, showing the absolutely good position.

bandage was placed on the foot so as to prevent the foot-drop, which made it difficult for the boy to use the foot. The boy is now beginning to walk without the aid of a crutch (Fig. 53). His elbow, which had been discharging somewhat, eliminated a small sequestrum and then healed up with perfect restoration of the function.

Here, then, is an example of the possibility of avoiding amputations. Of course, the pathologic condition in this case was not tuberculosis, and therefore, once the septic process was eliminated and the cause removed, the process did not return, but the same principle applies to tuberculosis if such a radical operation of the bones and structures is possible.

While I said in the beginning that conservative surgery is indicated in all surgical procedures on the extremities, particularly the hands, it is more so in children, since in children even small patches of periosteum help to re-form bone so that a good deal of lost substance can be replaced. The *x*-ray pictures in this case in particular show that in a very short time calcareous deposits formed from small bridges of periosteum, imitating more or less the skeleton which had been removed.

EXTENSIVE LACERATION OF THE FOREARM AND HAND WITH DECOLLATION OF THE INTEGUMENT, LACERATION OF MUSCLES, AND FRACTURE OF BONES; OPEN WOUND TREATMENT; RECOVERY WITH PERFECT FUNCTION.

On April 23, 1917, Mr. John E. was brought to the hospital with a severe injury of his left forearm and hand. He is a mechanical engineer in a paper manufacturing concern, and was just giving orders to a man to stop the engine when the man accelerated it instead by working the wrong lever, and in doing so he pulled the engineer's hand between two rollers. With a jerky movement the injured man pulled back his fingers before the rollers which were connected with a strong spring had a chance to get a firm hold on the larger portion of his hand, otherwise it would have been crushed to a pulp. This jerky movement, together with the suction of the rollers, tore the skin from the forearm and pulled it, with some of the underlying structures, over the hand up to the fingers like a glove is pulled off of a hand, tearing with it a number of the muscles, some tendons, nerves, blood-vessels, and breaking the metacarpal bones just below the heads of each metacarpas except the thumb. The patient was considerably shocked when he came. The skin which had been rolled up on the hand toward the fingers was covered with a piece of cheese-cloth and there was a tourniquet made of a towel around his forearm, nevertheless there had been some bleeding from the hand. The integument was considerably soiled by oily material such as an engineer would have on his hands while working. There were some particles of dirt on the surface of the lacerated hand. Only 1 inch of a bridge of intact skin corresponding to the external portion of the forearm was left, the balance was severed as by a sharp instrument. The picture shows the condition, looking at it from the radial side of the hand (Fig. 54).

The question arose as to the treatment. There was a great deal of temptation to sew up the wound with some tube drainage after possibly having reunited those structures which had been severed, like muscles and tendons.

The first step was the ligation of some of the vessels, and then I decided to treat it according to the principle of the open wound treatment—*i. e.*, to pack the large cavity underneath the skin loosely with gauze, allowing every bit of secretion to discharge through the wide open breach in the skin. We gave the patient an injection of antitetanic serum and put him to bed, immersing his hand in a light antiseptic solution of lysol which was continually heated by an electric lamp. This continuous bath was changed to an ordinary moist dressing after he had remained free from fever for forty-eight hours.

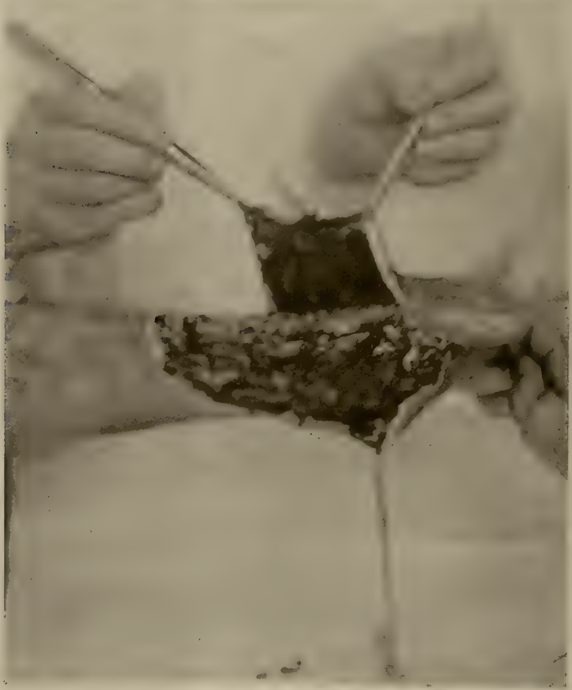

Fig. 54.—Aspect of the wound immediately after the injury. Viewed from the radial side.

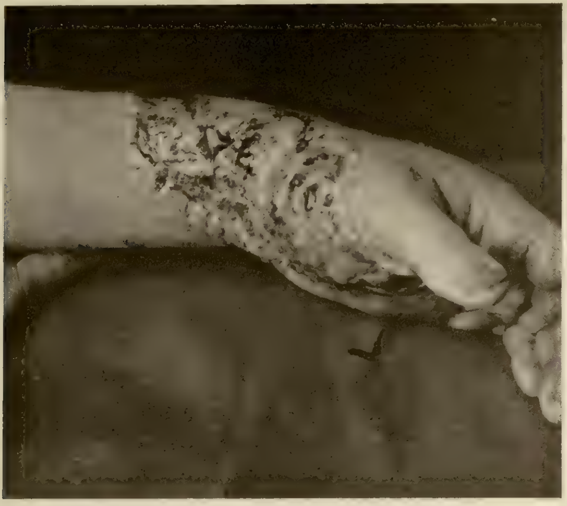

Fig. 55.—Appearance of the hand after removal of the pack. Part of the tissues of the thumb sloughed off.

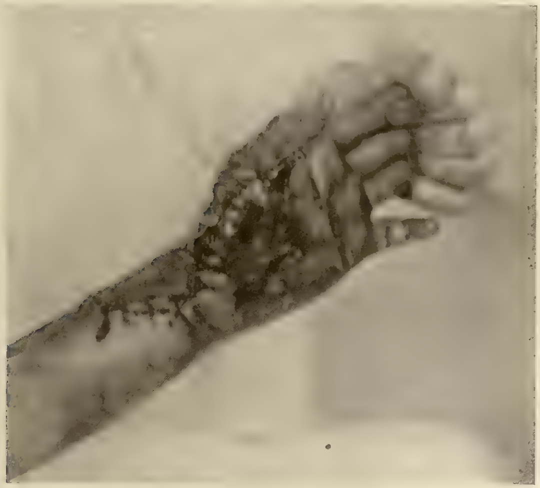

Fig. 56.—Appearance of the hand after secondary suture has been made showing the union without reaction except in the region of the thumb. Here the skin appears black, but is still continuous with the healthy skin.

Our greatest concern was to prevent infection of the sheaths of the remnants of the tendons. Inasmuch as some of those tendon sheaths had been torn open and were in open contact with the air, a retention of secretion would certainly have caused abscesses and the leakage of infectious material into the hand and forearm. As it was, there was not the slightest reaction beyond the tear in the forearm. After one week the inner surface

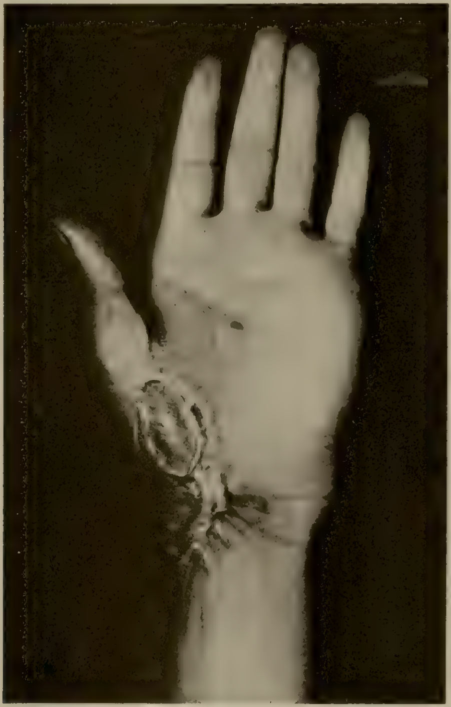

Fig. 57.—Showing the hand at present time held up in extension. The elliptic piece of skin over the thumb is the skin-graft which has been transplanted from the arm. The scar over the radial part of the wrist is still somewhat hard, but is getting better continuously.

was bright red, on some places beginning to granulate, on others still throwing off some of the superficial necrotic tissue, but luxuriantly red. It was then deemed opportune to sew up the wound, and under general anesthesia the wound was sutured as far as possible along the lines of the old tear (Figs. 55 and 56). Only in the region of the thumb a portion of the skin sloughed off, leaving exposed the muscles of the thenar eminence, which had become considerably swollen and were very bulky. A few skin-grafts were placed over this granulating area, two of which healed very nicely, the third one, however, became necrotic. For a long time there was considerable discharge from the tendon sheath of serous material. The hand looked very clumsy and stiff, but gradually even those few places which did not receive the skin-graft became covered with scar, and the clumsy hand which seemed almost motionless and stiff is now movable in every direction (Figs. 57 and 58). All the function and sensibility is restored and the edema to the greatest extent gone. There is only one hard scar corresponding to the short flexor of the thumb which prevents the patient from total abduction of his thumb. This hardened, callous scar will require resection. Strange as it may seem, everyone of the scars are somewhat keloid, a condition which, as my assistant observed, seems to pre-

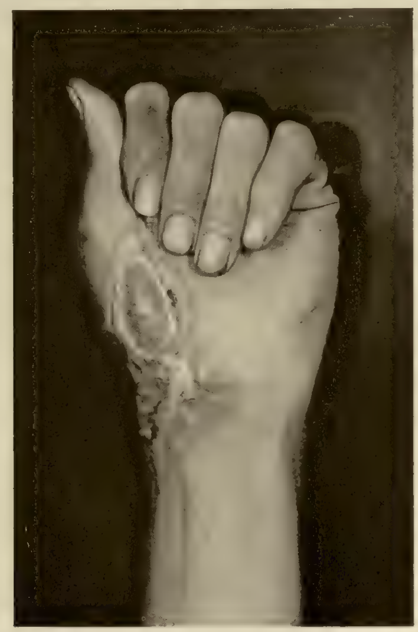

Fig. 58.—Showing the fingers in extreme flexion as far as it is now possible.

vail lately in a large number of wounds. The cause is not clear to me, but I see keloid much more often than formerly. The accompanying pictures show the extent of the injury.

Just at this time, in view of the war situation, it seems a good idea to dwell on such subjects as the treatment of large lacerated wounds with resultant perfect functional results, and that is the reason I have been describing this condition to you a little more in detail than might otherwise be desirable.

CLINIC OF DR. FREDERICK G. DYAS

Cook County Hospital

CLINICAL TALK ON LOCAL ANESTHESIA IN MAJOR SURGERY

Summary: Greatly extended use of local anesthesia in the last ten years; discovery of cocain and the invention of the hypodermic syringe and novocain; contra-indications for local anesthesia; combined nerve-blocking and infiltration the method of choice; local anesthesia and the relief of chronic pain.

It is a significant fact that in the statistics compiled from three large German hospitals in the last ten years the number of major operations performed under local anesthesia increased from 1 to 52 per cent. This statement, quoted from Braun, must interest the entire surgical profession. Furthermore, it is the experience of every operator that the morbidity and mortality from general anesthetics is still too great. Almost every day in a large operative service the surgeon must postpone operations because of the danger of a general anesthetic.

Local anesthesia, of course, has long antedated general anesthesia, having been practised by the ancients in the form of nerve compression, localized ischemia, the application of cold, and in the instances of open areas, the application of soothing herbs. Mention of the use of Indian hemp, mandragora, and poppy are found in some of the earliest medical writings. These local measures were frequently combined with the use of sedative drugs, such as opium and its derivatives, and to a much greater extent alcohol, in the form of rum and whisky. It remained, however, for the introduction of the hypodermic method and the administration of the concentrated form of drugs to renew the interest in local anesthesia.

There is some dispute as to whom the credit belongs for the introduction of this method. In this country Wood, in 1850, was given credit for the discovery of this method. However, Allen in his splendid treatise on local anesthesia, confers the credit for the discovery of the hypodermic syringe upon F. Rynd, of Edinburgh, in 1845. At first the hypodermic syringe was used for the injection of solutions of the derivatives of opium into and about nerve-trunks, and later such substitutes as chloroform and ether were used for local anesthetics. These drugs, however, were found to be unsatisfactory, and it remained for Schleich to popularize the hypodermic method of anesthesia by the use of cocain. Cocain deserves an equal place in the history of local anesthetics with the introduction of the hypodermic syringe. Cocain had been known for many years to the natives of certain tropical and semitropical countries in Central and South America. Its influence, however, as known to these semicivilized people at an early date, differed considerably from the physiologic action of the drug as it is employed today. The chewing of the cocoa leaves gave to the individual great powers of physical endurance and indifference to pain and fatigue. The leaves were, therefore, chewed by those in pain and by those undergoing severe physical tests. When the leaves were exported it was found by those who used them for similar purposes that like results were not obtained. This was probably attributable to the changes instant to drying and transportation (Allen). Köller in 1884 published a work on the local effects of a 2 per cent. solution of cocain in ophthalmic surgery. The use of this agent was then taken up largely by ophthalmologists and laryngologists, and since that date has been employed largely. It, however, has not been altogether satisfactory because certain individuals showed an idiosyncrasy for the drug, and in other cases fatalities resulted. As a result its use for a long time was confined to the so-called surface anesthesias, by which is meant the application of the drug by rubbing or dropping upon the mucous or abraided skin surface.

The use of cold as a local anesthetic has been employed generally in the form of rapidly evaporating agents, of which ethyl chlorid is the best known and most used. As a local anesthetic, however, this agent does not meet every requirement, and has the disadvantages of sometimes producing necrosis of the tissue.

The electric current has been used in connection with drugs, but has not been generally satisfactory. It remained for the introduction of novocain to give to local anesthesia the impulse which has popularized it within the last few years. The fact that novocain may be used in sufficiently large quantities for the production of an adequate local anesthesia for the performance of most major surgical operations has conferred a great blessing upon humanity. While novocain cannot be classed as absolutely non-toxic, it may be used in sufficient dosage to procure practical freedom from pain without hazard to the patient. The operator must ever bear in mind that the rapidity of absorption of any toxic agent is proportionate to the amount of risk incurred. Therefore, one may use a large amount of novocain in those situations where absorption is slow and where the amount used is spread over a considerable period of time without danger to the patient. The use of this agent is finding an ever-increasing field of usefulness. As contraindications to its use may be mentioned: (1) acutely inflamed areas, such, for instance, as an acutely inflamed appendix; (2) in very young children, and (3) in individuals who are hysteric. In intra-abdominal operations where considerable handling of the bowel is necessary and great relaxation of the abdominal muscles is desired, it is a good plan to supplement the local anesthetic with a short gas or gas-ether narcosis.

During this year I have increased the scope of the work done with novocain to include surgery of the bones, and have been surprised at the facility with which it is possible to do this work under a local anesthetic (Figs. 59, 60). The method of choice in the production of local analgesia is the combined infiltration and nerve-block, as advocated by Heinrich Braun. In a short analysis of the subject such as this it is impossible to give all the various methods for the different types of operative procedure, but this general principle will hold good for all cases—*e. g.*, the infiltration of the skin along the line of incision and the blocking of the nerves supplying that area. By this method it is quite possible to do painless amputations and all types of major sur-

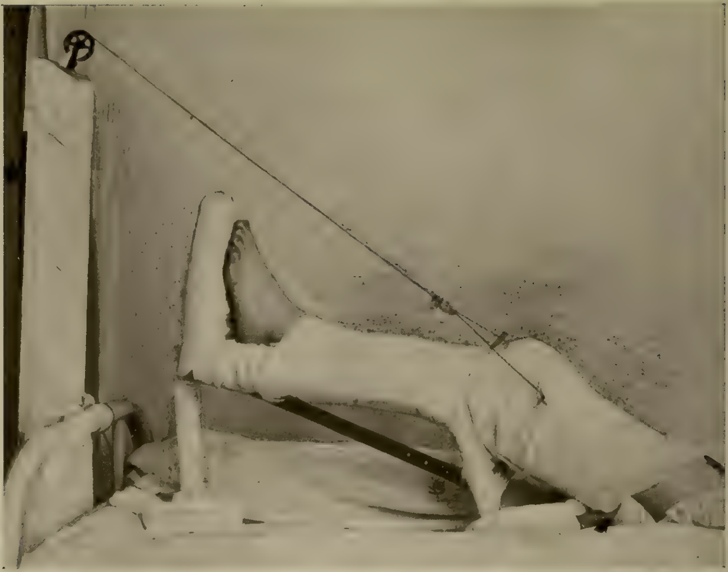

Fig. 59.

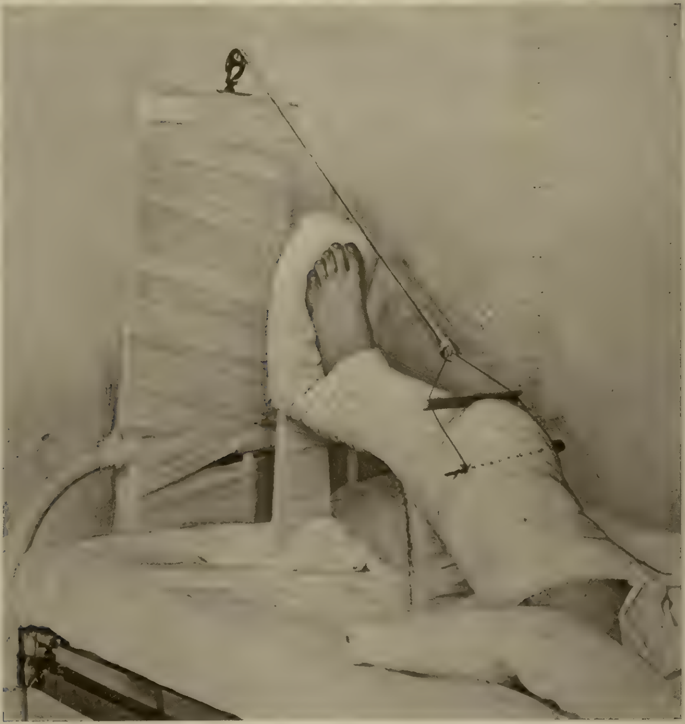

Fig. 60.

gery. The method of Kühlenkampf for the blocking of the brachial plexus at a point just behind the middle of the clavicle and extending downward until the needle touches the first rib as it passes beneath the clavicle, and then withdrawing the syringe slightly, meanwhile asking the patient to exclaim when he feels the sensation reaching down his arm, and then injecting from 5 to 10 minims of ½ per cent. novocain and adrenalin solution, will produce a complete anesthesia of the upper extremity. By this method I have been able to reduce old Colles' fractures with entire absence of pain to the patient. A slight motor paralysis may follow the use of Kühlenkampf's method, but it is only temporary and is a negligible consideration in the procedure. This method also affords relief in malignant growths about the shoulder. In one case of sarcoma of the humerus with intense pain the brachial plexus was injected after the manner of Kühlenkampf and the patient immediately declared that he was free from pain. It may also be used for the relief of pain in chronic conditions, such as carcinoma of the uterus, by the blocking of the sacral plexus through the sacral foramina.

I believe that the field of local anesthesia in the future will not at all be limited to surgical anesthesia, but will include within its scope the relief of chronic pain, as is already being done by the neurologists in the injections of the trigeminus for tic douloureux. The security with which many operations may be done with local anesthesia makes it incumbent upon the surgeon to present its advantages to the patient before operation, in order that the patient may choose for himself whether he will accept the hazard of a general anesthetic or undergo the operation with entire freedom from pain by the local route. The success which attends the use of local anesthesia increases in exact proportion to its use. The more one uses it, the more proficient one becomes, and the less pain is suffered by the patient. In a series of 85 inguinal herniotomies done under local anesthesia no infection resulted which could be traced to the anesthesia, and in no instance was

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Figs. 59, 60.—Application of Steinman nail extension to fractures under local anesthesia. In this case the nails, shown in place, were driven through the condyles of the femur, using ½ of 1 per cent. novocain solution for analgesia.

it necessary to resort to general narcosis. The method has a further great advantage that the operator must be gentle in handling of the tissues, as a result of which operative trauma is minimized. The general comfort of the patient after the operation is much improved because of the lessened trauma in the operative field. Convalescence is not complicated by the anesthetic. Ambulatory patients may be immediately discharged after the operation. An anesthetist is not necessary, but a moral anesthetist is desirable. The use of adrenalin renders the field less bloody, prolongs the anesthesia, delays absorption, and thereby lessens the toxicity. The nerve-block as an anesthetic for chronic pain has as wide an application as its use for operative procedures.

DIVERTICULUM OF URINARY BLADDER

Summary: Diagnosis simplified by use of cystoscope and *x*-ray; pathology disclosed at operation; methods of treatment; suprapubic drainage adopted in present case; prognosis.

THIS patient, a laborer, aged fifty-two years, presented himself because of difficulty and pain upon urination. Five years ago he began to have difficulty in passing urine. There was no pain associated with it at that time, but when he attempted to urinate, a small stream would come and then stop, and then another stream after straining. He states that up until five years ago he never had any trouble during urination.

Previous History.—It is of importance to record that twelve years ago the patient had a Neisserian infection. However, no stricture resulted from this infection. He states that he was treated by means of an electric light passed into the bladder and that he has had no return of the trouble. He denies syphilis. His history otherwise is unimportant.

On examination the only finding of interest is the presence of a large oval swelling just above the symphysis pubis, corresponding to the region of the urinary bladder. It is dull and painful to percussion and not freely movable. There is marked rigidity over the mass. Examination of the prostate per rectum shows no enlargement of any of the lobes, no irregularities, and no hard areas. It is of normal consistency and not tender.

A clinical diagnosis of acute urinary retention, possibly due to stricture, was made. A metal catheter was passed and 1 quart and 4 ounces of urine were removed. He was referred to Dr. Frank N. Pfeifer for cystoscopic examination, who reports the following:

"On May 16th the bougie introduced shows a distinct narrowing 16 cm. from the meatus urinarius. Size No. 15 French was introduced and this was readily dilatable to a No. 19. A gum bougie was introduced and 24 ounces of urine withdrawn. This was followed by the insertion of 1 dram of 1 per cent. silver nitrate solution."

Two days later a cystoscopic examination was made by Dr. Pfeifer, with the following findings:

"The urethra was found to be distinctly tortuous at 16 cm. from the meatus urinarius and was pushed over to the right. On digital examination there was felt a distinct infiltration at the apex of the prostate. This possibly accounts for the findings in the urethra. I was able to introduce a No. 18 French cystoscope. The bladder medium was hard to clear, continually being fouled by pus. On the introduction of the lens system the cause of this was apparent, as there was a distinct opening in the bladder wall slightly to the left of the median line and posterior to the interureteric ridge. The size of this opening was approximately $\frac{1}{2}$ inch, and from it there poured a continuous stream of pus which had its origin in a sac or pouch, evidently a diverticulum of the bladder. The bladder mucosa in general showed a distinct loss of lustre. The mucous membrane was red, thickened and swollen, and there was also a tendency to trabeculation, but in no other part was it possible to see a distinct diverticular opening. The diverticulum is round. No trabeculation was seen in the immediate and surrounding areas. The ureteral orifice was not visible. The trigone was swollen and elevated and the vesical neck was red, the mucous membrane swollen, and there was a distinctly elevated border. This latter was due to the enlargement of the middle prostatic lobe. The lateral lobes showed very little enlargement, particularly in the intravesicular protruberance. The posterior urethra was elongated, especially that portion between the verumontanum and the vesical neck. The verumontanum was enlarged. The posterior urethra also was markedly dilated. The posterior sulcus and also the prostatic sulcus on each side of the verumontanum were entirely obliterated by these distentions. This is very unusual and was undoubtedly due to the condition of the apex of the prostate. This condition is extraurethral and not in the lumen of the canal.

An *x*-ray catheter was passed into the diverticulum and a skiagram made. Thorium nitrate was injected into the diverticulum, but was a failure, as the diverticulum evidently contained considerable water, and the dilatation caused a failure to produce a shadow. On examination by the *x*-ray the position of the catheter was shown (Fig. 61). The diverticulum is very large, and the reason that the catheter did not coil was because it was not long enough.

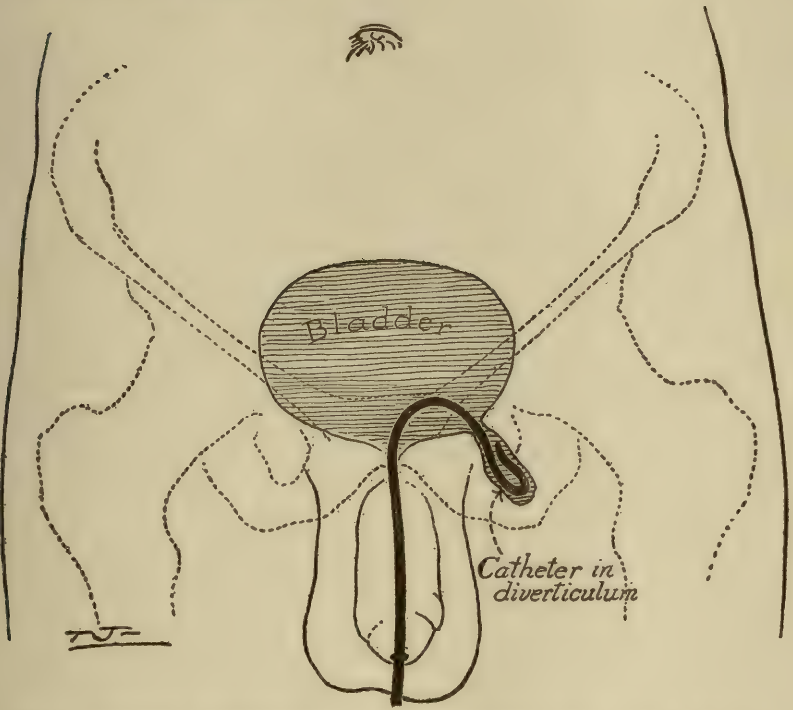

Fig. 61.—Diagram illustrating *x*-ray findings with shadow catheter in diverticulum of the bladder.

"There seems to be two distinct obstructive lesions in this case, one at the vesical neck and the other at the apex of the prostate. A suprapubic cystotomy is advised."

Report of the *x*-ray findings by Dr. Blaine are as follows:

"The catheter passes to the right of the median line inward to a point opposite the sacrum. It then crosses downward and to the left and to about the lateral wall of the pelvis. Then it folds on itself and passes upward and inward and over to the right side in a wide curve. This may be due to the large diverticulum of the bladder."

OPERATION

The patient was anesthetized and, with the usual preparation, a suprapubic cystotomy was performed. Upon retracting the cut edges of the bladder a very much thickened bladder mucosa came into view. There was no evidence of pus. The trabeculation and absence of lustre described in the cystoscopic findings were clearly evident. At one point to the left of the median line a large dimple in the mucous membrane was exposed. Upon introducing a hemostat and spreading the jaws a large amount of pus gushed out. When the forceps was removed and the opening closed, the pus could be sponged out of the bladder, which was then apparently free from pus. Upon introducing the forceps again more pus came out. This diverticulum was about 3½ inches long and about 1 inch in diameter. It was held closed at its upper end, and this accounted for the findings upon cystoscopic examination, that manipulation of the bladder caused the medium to become foul with pus.

Dr. G. J. Thomas, of Rochester, in an article entitled "Diverticulum of the Urinary Bladder," published in Surgery, Gynecology, and Obstetrics, Vol. 33, No. 4, October, 1916, reviews the embryology and etiology of vesical diverticula and describes the methods for their cure. The four routes of approach to the lesion with the intention of making a radical excision, as quoted from Lerche in The Lancet, 1912, vol. 32, p. 337, are:

(*a*) The vaginal.
(*b*) The sacral.
(*c*) Suprapubic intraperitoneal.
(*d*) Suprapubic extraperitoneal.

Thomas suggests various simpler methods as follows:

(*a*) Incision through the vaginal wall and drainage.

(*b*) Establishment of a fistula by sewing the diverticulum to the skin.

(*c*) Peritoneal drainage behind the bladder.

(*d*) Peritoneal drainage of the bladder.

(*e*) Forcible stretching of the orifice of the diverticulum.

(*f*) Curetment of the mucous membrane of the diverticulum and suture of the latter without drainage.

(*g*) Invagination of the diverticulum and the bladder, freshening of the margin of the orifice, and closure intraperitoneally.

(*h*) Enlargement of the orifice of communication between the diverticulum and the bladder wall, or a new anastomosis.

(*i*) Division of the walls of the bladder and diverticulum and suture of the cut walls.

(*j*) Suprapubic drainage.

The last mentioned was the method followed in our case. Two drainage-tubes were used, and one was sutured by catgut into the diverticulum and the other was secured by adhesive to the skin of the abdomen for bladder drainage. The patient was immediately better after the drainage and within a week began to urinate by the natural route. The drainage-tube into the diverticulum was freed at the end of ten days and no pus was found in the urine. The drainage-tube in the bladder still remains at the end of three weeks, but will be removed, and the patient should have a clinical recovery.

It was impossible in this case to invaginate the diverticulum, and it was thought that it might be dangerous with so large a diverticulum to obliterate the opening by curetment and suture. The extensive operation by the sacral or peritoneal routes were thought to be too hazardous for the patient, who was in a low state of health.

CLINIC OF DR. CHARLES DAVISON

Cook County Hospital

TWO CASES: I. SUCCESSFUL REPAIR OF FRACTURED FEMORAL NECK. II. REMOVAL OF EXOSTOSIS FROM INTERNAL CONDYLE OF FEMUR.

Summary: Case I. Fracture of neck of femur—technic of repair by bone transplantation; preparation of operative field—dangers of antiseptic solutions; choice of anesthetic; the two incisions—anteriorly through which to maintain reduction, laterally for introduction of transplant; result as shown by present case.

Case II. Congenital and acquired exostosis of medial condyle of femur—how to differentiate; treatment.

FRACTURE OF NECK OF FEMUR: BONE TRANSPLANT

This patient, B. A., Norwegian, clerk, married, aged thirty-eight years, was injured by falling on an icy sidewalk on January 21, 1917.

He was admitted to Cook County Hospital on the following day. Examination showed loss of function of the entire left lower extremity. There was external rotation of the leg with eversion of the foot. Bryant's line was shortened. The patient complained of acute pain in the hip on manipulation of the extremity. A roentgenogram taken on the following day showed a clean-cut fracture without impaction through the neck of the left femur (Fig. 62).

Open operation and autoplastic repair by the transplantation of a segment of the fibula across the line of fracture was performed seven days after the injury according to the following technic:

The field of operation was prepared by fractional sterilization. The part was shaved, scrubbed with green soap and hot water, washed with a solution of bichlorid of mercury, rinsed with sterile water, and covered with sterile gauze. At the end of twenty-four hours this preparation was repeated. At the time of operation we do not use bichlorid, iodin, or any other antiseptic, for the reason that any antiseptic material getting on the transplant will kill the superficial bone-cells as surely as it will kill pyogenic germs. The death of the superficial cells, either of the transplant or of the host, prevents bone-grafting, and the operation results in failure.

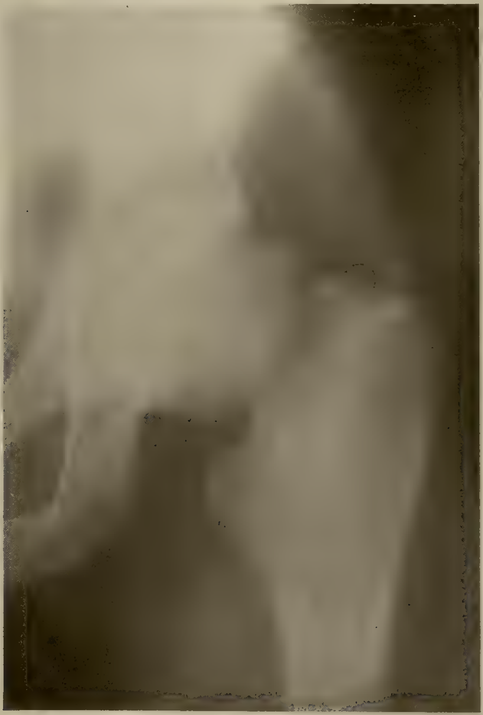

Fig. 62.—Roentgenogram of fracture of the neck of the left femur.

The anesthetic is important in these cases because of the length of time required to perform the operation and the shock which accompanies it. In these severe bone operations the vitality of the patient must be conserved in every way. We are using the combined gas-ether-oxygen method of anesthesia. We find that by combining the warm mixture of these anesthetics in varying quantities, according to the condition of the patient and the requirements of the operation, a minimum of shock is produced. A hypodermic injection of morphin and atropin precedes the anesthesia.

In our work we use a modification of the Lane technic. Many of the bone-grafting cases are tedious and mechanically difficult. Handling everything with forceps hinders and delays the operator materially. For this reason the sponges are used with the hand. The sponge is picked up in this manner (indicating), inserted into the wound, removed, and cast aside without the gloved hand coming in contact with the wound. The hand is not allowed in the wound except when protected by gauze, which is immediately discarded. Infection is no more likely to occur in a bone-grafting operation than in any clean bone operation. The technic of the operation consisted in open reduction of the fracture, stabilization of the fragments by a segment of fibula, and complete external immobilization of the hip-joint by plaster of Paris.

A perpendicular incision was made below the anterosuperior spine of the ilium, exposing the fracture in the neck of the femur. The detritus and loose fragments of bone were removed from the site of the injury. The fragments were reduced. An incision was made on the outer side of the thigh just below the greater trochanter. With a hand instrument a canal, for the placing of the transplant, was made through the outer part of the femur below the greater trochanter, through the neck and into the capital fragment.

The direction of this canal was such that the transplant would enter at an angle to the shaft of the femur of about 135 degrees, so that it would rest upon the base of the lesser trochanter and enter the capital fragment above the depression for the ligamentum teres. The canal was made slightly smaller than the transplant.

A segment of the lower part of the fibula of the same extremity 14 cm. in length was removed without its periosteum for use as the peg transplant. The canal through the cortical part of the femur was fitted to receive the transplant. With the reduction maintained through the anterior incision over the fracture, the transplant was driven into the canal, pegging the fragments firmly together in reduction.

The thigh was placed in external rotation to relax the muscles attached to the greater trochanter and slightly flexed to relax the iliopsoas muscles. The extremity was placed in extreme abduction to prevent a muscular cross-strain at the fracture.

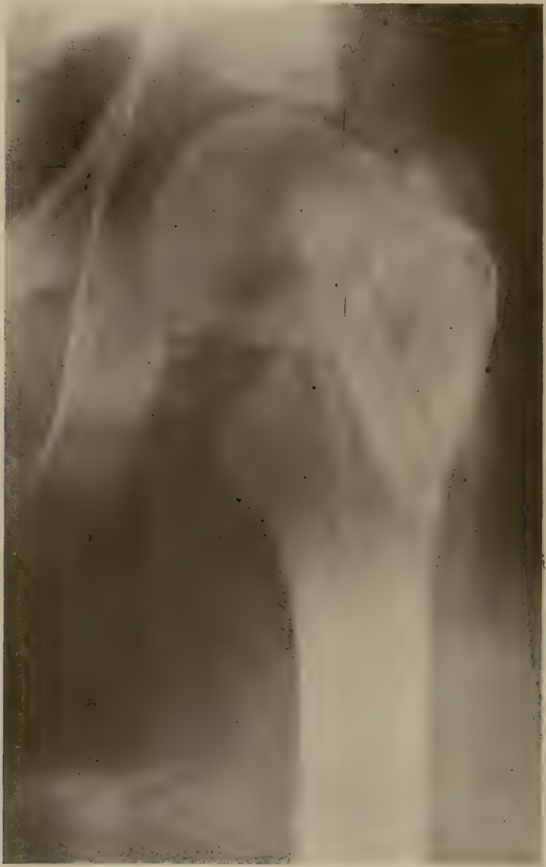

Fig. 63.—Roentgenogram of autoplastic repair of fracture of the neck of the femur three months after operation, showing the peg transplant grafted across the line of fracture with bony union of the fracture.

After a final examination of the reduction the wound was closed and external immobilization applied. The plaster cast extended from the axilla to the toes on the injured side and to the knee on the opposite side, to prevent shifting of the back and thigh in the cast.

Complete immobilization of the transplant to its host is essential to enable the transplant to graft into its new position.

After eight weeks the cast was cut away to relieve the knee-joint, and after three weeks more the cast was entirely removed and the patient allowed to be about on crutches.

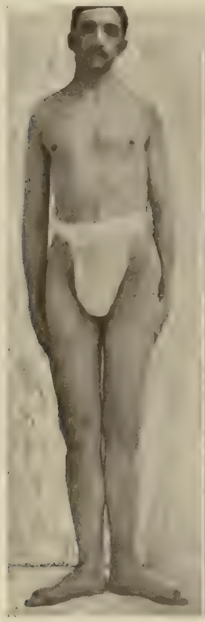

Fig. 64.

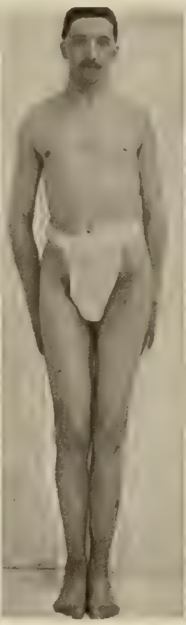

Fig. 65.

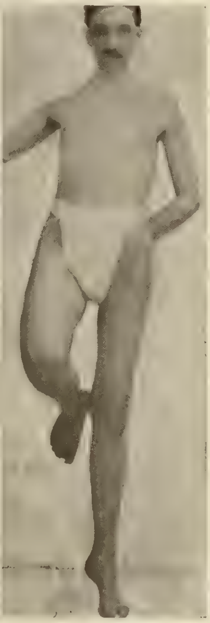

Fig. 66.

Fig. 64.—Standing erect with both feet on the floor, showing extreme external rotation of the thigh.

Fig. 65.—Standing erect with both feet together on the floor, in normal voluntary position of rotation of the injured (left) extremity.

Fig. 66.—Standing with full weight on the toes of the injured (left) extremity.

You can see the scar locating the anterior incision through which the capital fragment was controlled during reduction. You can see the location of the lateral incision through which the transplant was inserted. The *x*-ray taken yesterday shows the position of the transplant, bony union of the fracture, and the presence of the bony callus (Fig. 63). Notice the angle of the transplant. I tried to place it at a greater angle to the shaft of the femur than the normal angle with the neck, so that the contraction of the muscles would force the capital fragment against the transplant without producing a cross-breaking strain upon the transplant.

This man can walk on the injured extremity (Fig. 64). He can stand erect with his heels and toes together in normal rotation (Fig. 65). He can stand on his toes (Fig. 66). He can abduct his thigh (Fig. 67). He can flex his thigh (Fig. 68).

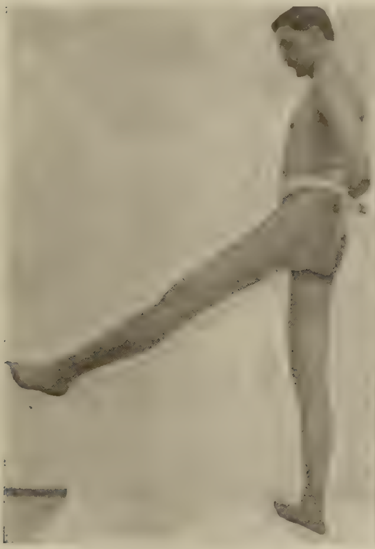

Fig. 67.

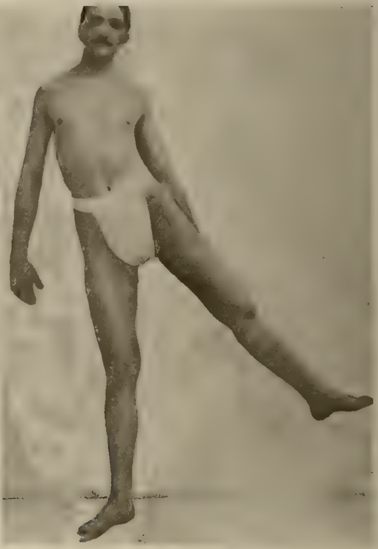

Fig. 68.

Fig. 67.—Degree of voluntary abduction at the hip-joint.
Fig. 68.—Degree of voluntary flexion at the hip-joint.

Because of the danger of falling and refracturing the hip, I am endeavoring to keep him from walking without crutches until by exercise and massage the muscles and joints are restored to their normal activity and functional ability.

EXOSTOSIS OF THE FEMUR

This patient, M. D., Irish, laborer, single, aged twenty-seven, was admitted to the hospital complaining of pain in a hard mass attached to the internal condyle of the right femur. He tells us that the mass has been there as long as he can remember, but never gave him any trouble until one year ago. It has lately been increasing in size. There has been a constant dull, aching pain during the past year. He entered the hospital to have it removed.

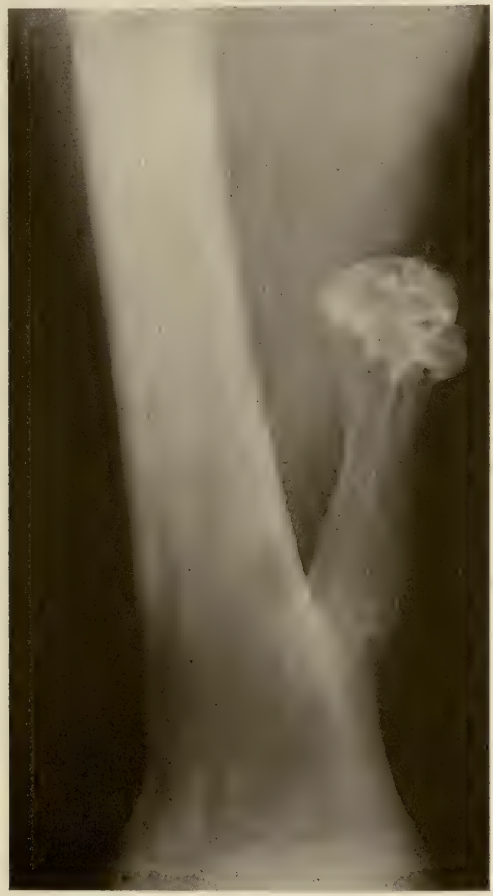

Fig. 69.—Roentgenogram of exostosis of right femur.

The roentgenogram (Fig. 69) shows a bony, mushroom-shaped growth attached to the internal condyle of the femur and extending in the direction of the tendon of the adductor magnus.

This bony growth may be congenital or it may be acquired. If it is congenital, the tendon of the muscle may be attached to its upper expanded surface. If it is acquired, the tendon of the muscle may be stretched over its anterior surface. It may be the result of an ossifying process in the tendon of the adductor magnus.

In the operation the attachment of the tendon of this muscle must be conserved.

Operation.—I will make a longitudinal incision over the exostosis, cutting through the skin, fat, and deep fascia, exposing the muscle. The muscle and its tendon are stretched tightly across the mushroom-like mass, but not attached. I push aside the tendon and expose the exostosis, which is free from the surrounding soft tissues, but attached to the internal condyle of the femur.

I am careful to avoid opening the knee-joint. I remove the exostosis with a sharp chisel and close the wound in the usual manner.

CLINIC OF DR. CHARLES A. PARKER

HOME FOR DESTITUTE CRIPPLED CHILDREN

A NON-OPERATIVE CLINIC ILLUSTRATING THERAPEUTIC MEASURES EMPLOYED IN A VARIETY OF ORTHOPEDIC CONDITIONS

Summary: Cerebral spastic paralysis—Little's disease. Method of handling; prognosis depends upon mentality.

Four cases of infantile paralysis, one recent and three older. Examination; differentiation from the spastic type; method of treatment varying in different cases—long-continued rest in bed with supporting apparatus for acute cases; corrections, apparatus, and muscle training for the older.

Three cases of knee-joint tuberculosis, two in children and one in an adult; the former in good position in casts, the latter suffering from improper operative interference, now in a cast with the knee not yet in good position—that of complete extension. Necessity of keeping patient off of feet during treatment while knee is bent or still painful.

Tuberculosis of os calcis now entirely cured after two years of cast treatment without operation.

Congenital club-foot operated upon several weeks ago. Still wearing cast, which is frequently necessary for many months after correction to prevent relapse.

Acute suppurative destruction of the upper femoral epiphysis—so-called epiphysitis. This case was more fully reported in the August CLINICS.

Leg ulcer in adult. Adhesive plaster strapping and proper support almost a panacea. Patient allowed to continue work during treatment.

Scoliosis. Preparation of corrective jacket.

THERE is no operative work today, but I think you will be interested in the variety of orthopedic work that comes into our out-patient department.

CASE I.—CEREBRAL SPASTIC PARALYSIS

This boy is now twelve years old and walks in with the aid of two crutches. The brief history is that the birth was a difficult forceps delivery. As a child he was backward and weak. When five years old the shortened tendo achillis was cut in either leg, after which he was able to walk. A year and a half ago he first came to us with knees flexed 40 degrees and adductors tense, allowing a separation of the knees of only 10 inches. There was spasticity present and he walked with bent knees and a shuffling gait.

December 6, 1917, under ether anesthesia, a subcutaneous myotomy of the adductors in both thighs was performed, and the inner and outer hamstrings of both knees were tenotomized. The legs were then straightened and widely abducted and put up in plaster-of-Paris from the navel to the tips of the toes. Two months later these were removed and removable casts were made to hold the knees straight, and the child was sent home, since which time he has occasionally returned to the clinic for observation. This is, as you know, primarily a cerebral condition.

Present condition: Although he uses his crutches for safety, he does walk some without them. He removes his casts at night and the legs remain straight until he reapplies them in the morning. His mentality has greatly improved. He is in the fourth grade of the Spalding School for cripples and is inclined to be quite jovial in his conversation. The legs can be widely abducted with very little restraint. The reflexes are greatly increased in this condition, thus differentiating it from the flaccidity of infantile paralysis, to be seen later. With his limbs in proper position he now needs much help in muscle training to regain as nearly as possible normal muscle balance, which is so seriously disturbed in this condition. The prognosis as regards physical development depends greatly upon the mental improvement. The best physical apparatus in the world is of little use to an idiot, but a good mind will do wonders with a poor physical legacy.

CASE II.—RECENT INFANTILE PARALYSIS

This boy is thirteen years old. I saw him recently at the County Hospital, where he had been taken four weeks previously suffering from an acute attack of infantile paralysis affecting one leg and the trunk. At present he cannot flex his trunk sufficiently to raise his body from the table as he lies on his back.

The anterior group of muscles of the right leg is weak. He has been wearing a removable cast extending from the toes to the perineum with the leg straight and feet at right angles. This was applied at the County Hospital recently, but has been left at home today, as the father thought it too heavy while carrying the child. He will be advised to continue the use of the cast for several months, with no attempts at walking or even sitting upright, as with such an extensive paralysis of the abdominal muscles scoliosis is very likely to develop if the upright position is assumed early and the trunk muscles remain weak or paralyzed. He should be brought to the clinic at least once a month for examination and advice.

CASE III.—OLD CASE OF INFANTILE PARALYSIS

This girl is now nineteen years old. She had an attack of infantile paralysis when three years old. She wore braces from the time she was six years old until she was nine, when they were discarded as being useless. When she first came to us a year ago she was able to get around on crutches, landing each time on her left leg, which was overextended at the knee, but not able to stand on the right, which lacked 10 to 15 degrees of complete extension. She was unable voluntarily to extend either leg at the knee, and the right foot, though possessing no active function, was easily put in good position.

There was a recurring dislocation of the left shoulder-joint from paralysis of shoulder muscles. The muscles of the left hand were also defective, especially the opponens pollicis. In addition, there was a long sweeping curvature of the spine to the left with marked rotation occupying the middorsal and lumbar regions, so that in the sitting posture the back was shortened several inches by its curved and relaxed condition.

At that time a cast was put on the right leg with the knee forcibly held in extension, and this was worn with changes nearly six months. Last December a plaster-of-Paris corset was applied with the patient lying on her back on a narrow strip of canvas in an Abbott frame. This corset or pattern was immediately removed by cutting it down the middle in front, when it was sealed in front and across the bottom, and cast full of plaster-of-Paris, thus giving us her plaster torso to work upon in the production of the ultimate corset. The torso was corrected by shaving off the more prominent deformities with a draw-knife and adding more plaster to fill up the hollows till the completed torso approached closely that of the normal figure. Over this the final corset of plaster-of-Paris was made. It is the one that is now placed upon her and buckled with four straps across the front, giving her a form that any young lady might be proud of.

At present the right leg is straight at the knee, while in the left there is still some recurvation. In neither is there active power of knee extension, and the patellar reflexes are lost, thus differentiating it from the spastic type just shown, in which they were greatly increased. A tracing of both legs and feet is made to be sent to the instrument maker for a pair of braces, the one on the left leg to prevent recurvation and the one on the right to prevent involuntary flexion.

With the braces and corset she will be able to stand firmly erect and need the support of her crutches only in swinging from one standing position to another. Braces will now be entirely effective and easily hold the limbs, since they have been placed in the proper positions. It is a fundamental rule that the *ambulatory braces should not be applied until the limbs are placed in the proper position with the knees extended and feet at right angles to the legs.* Lack of attention to this particular is responsible for much disappointment in the use of braces.

CASE IV.—INFANTILE PARALYSIS

This patient is two years old and began to walk on the outer side of his foot when eighteen months old. I first saw him several months ago at the Cook County Hospital. His foot was then in varus, with a weakness of the peronei muscles. It was corrected manually without an anesthetic and put in plaster. Several casts have since been applied. The foot now retains its position much better when the cast is off, but it is not yet safe. Perhaps the peronei may recover their function if their opponents are properly restrained for a sufficient length of time. He is too young for satisfactory muscle training, and the restraint of the stronger muscles is the most important thing at present.

CASE V.—INFANTILE PARALYSIS

This child is now nine years old. She had an attack of infantile paralysis when three years old, and she has been under our care more or less constantly ever since. The trouble has been limited in its effects to the feet, which have never been very bad, but always with a tendency to equinovarus. The girl is now wearing a cast on her right foot, which was applied several weeks ago for the correction of slight equinus. This cast will be removed and another applied, with the knee held flexed and the foot over-corrected in dorsal flexion. The left foot was recently corrected in a similar manner. The general shape and function of these feet are now not far from normal, and really better than many feet that have been distorted by improper shoes.

This non-operative clinic illustrates many of the slower measures used by the orthopedic surgeon to obtain worthwhile results in a class of cases that the general surgeon usually has neither time nor inclination to treat.

CASE VI.—TUBERCULOUS KNEE

This child is four years old. The trouble in the right knee was first noticed last April, when she complained of pain at night. She came to us a month ago with the right knee slightly flexed and painful. She had worn a cast for a month and a half, but for some reason had been without a cast for a month when she came here. It has now been in a cast for a month and a new one will be applied today.

Another inviolable orthopedic rule is: *Never remove a cast from an inflamed joint until you are ready to immediately apply another.* The neglect of this rule is responsible for much misery in joint surgery.

CASE VII.—TUBERCULOUS KNEE AND SPINE

This girl is eleven years old and appears well developed and in good health. She is wearing a cast on the left leg for tuberculosis of the knee-joint. About four years ago this patient had tuberculosis of the fifth lumbar vertebra, where there is now a distinct rounded eminence with no evidence of present disease.

The trouble commenced in the knee about a year ago. She came on to my service in the County Hospital about six months ago, and a cast was applied. This has been changed from time to time and the patient has worn a high shoe on the other foot and walked with crutches, not bearing her weight on the affected knee. When the cast is removed the knee appears only slightly swollen and moderately tender, with a limited amount of flexion. A new cast is applied with the knee straight. Probably in a month she will be allowed to walk on that leg if the knee continues as well as at present.

CASE VIII.—TUBERCULOSIS OF KNEE-JOINT

This man is forty-four years old and has been suffering from tuberculosis of the right knee for two years. He came on our service one month ago. He is now wearing a plaster cast extending from slightly above the malleoli to the perineum, with the knee in a position of 20 degrees of flexion. There is a fenestrum opposite the knee-joint, beneath which is a small discharging sinus. He has been wearing casts for about a month, during which time the knee has been straightened from a position of about 40 degrees flexion to the present position. When first examined there were several scars about the knee the result of four draining operations he has undergone in the last two years, with the very natural result of continued increase in trouble. These operations were not performed by an orthopedic surgeon. Following none of them was there a persistent attempt to protect or extend the joint, and he was allowed to walk upon it—a complete sermon of neglect. Now he wears his cast and goes on crutches. His pain has practically vanished. The cast will be changed once a month until the leg is straight, when, if the pain and symptoms remain quiescent, he may again be allowed to step on the foot of the affected leg.

Another orthopedic rule applies here: *Do not allow the patient* *with a flexed and inflamed knee to step upon the foot of the injured limb, even if the knee is in a cast.* For no matter how well the cast is applied, some grinding movement takes place in the flexed joint when standing upon it. When the knee becomes straight then walking upon the member may be resumed if no pain is present.

CASE IX.—TUBERCULOSIS OF OS CALCIS

This child is eight years old. She first came under my observation at the Cook County Hospital about two years ago suffering from tuberculosis of the left os calcis. At that time there was slight pain, some swelling about the ankle, and a discharging sinus on the os calcis. The foot and leg to the knee were put in a plaster cast with a fenestrum to dress the sinus, and the child kept in bed several months to keep her from walking on the foot. Later she was given crutches and a high shoe advised for the sound foot, so the affected one would swing clear in walking, and then sent home.

She has returned from time to time for observation and treatment by casts, eventually walking on the foot while wearing a cast. She has now worn no cast for the last three months and there is no evidence of present disease. There are two scars of the former sinuses and all movements are normal and painless. She will return for observation once a month. As the child had suffered several years before coming under my care, the complete cure has probably taken three or four years, the usual length of time for these conditions where permanency of cure is demanded.

CASE X.—CONGENITAL CLUB-FOOT

This little girl is now two years old. August 1st she was operated upon for congenital equinovarus of the left foot. She is wearing a cast and the foot appears to be in good position. It will now be removed, and although the position is good, another will be applied with the foot dorsal flexed to less than a right angle and in marked valgus. She will continue to walk in this cast for a month, when it will be removed, and if correction is considered complete and safe, further treatment may not be necessary, though it should be kept under frequent surveillance for a long time. This is a comparatively simple case. In more stubborn cases casts or braces may have to be worn for a year and even longer after complete correction to prevent relapse.

CASE XI.—ACUTE SUPPURATIVE DESTRUCTION OF THE UPPER FEMORAL EPIPHYSIS, SO-CALLED EPIPHYSITIS

This child is something over two years old. He came to us in February suffering from pain in the right hip, which at that time was swollen and flexed 45 degrees, with a history of an inflammatory affection of the joint antedating that period several months. An x-ray showed a loss of the upper femoral epiphysis with an upward displacement of the neck. (Reported in the SURGICAL CLINICS OF CHICAGO, August, 1917.) An abscess developed later and the joint was drained. His general condition now is good. He is now wearing a plaster-of-Paris hip spica with lateral fenestrum for the discharging sinus. The cast is soiled and broken and will immediately be replaced with a stronger one. The cast is used to enhance healing and to prevent the development of a flexion deformity.

CASE XII.—LEG ULCER

This is a woman, forty-six years old, with two typical ulcers of the leg, now much reduced in size, but still measuring from 1 to 2 cm. in diameter, accompanied by very firm regional edema and moderate eczema.

Adhesive plaster strips 2 inches wide and long enough to encircle the leg are applied over the ulcers and drawn tightly around the leg. Zinc salve is then used on the eczema and a tight muslin roller applied. The patient comes once a week, when the adhesive plaster is removed and fresh strips applied. She remains active upon her feet. The ulcer is reducing satisfactorily, the eczema is diminishing, and the leg is becoming much smaller in the edematous region. This is a well-tried and very satisfactory treatment for leg ulcers.

CASE XIII.—SCOLIOSIS

This girl is fifteen years old and is wearing a plaster-of-Paris corset that was made for her over a corrected torso about ten months ago. It is still in fair condition, but a new one is desired. She will return next week to have a pattern made for a new torso in the manner described in Case III, although the pattern in this case is made with the patient standing, as she has no paralysis.

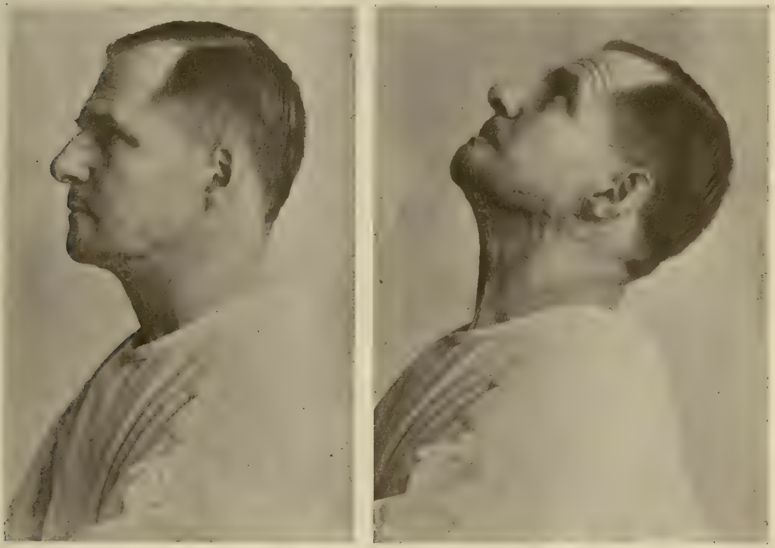

Fig. 70. Fig. 71.

Figs. 70 and 71.—Two photographs illustrating the result in a case of extensive burn of the neck treated by adhesive plaster strips and an apparatus to prevent contractures. Original condition and method of treatment shown in June Clinics.

(This patient was admitted to the County Hospital on the 20th of February, 1917, with a complete "collar" burn of the neck extending upon and destroying the skin of both ears in addition to that of the whole anterior and lateral regions of the neck. The various stages in the treatment by means of adhesive plaster strips and plaster-of-Paris collar and cape are well shown in the June Clinics. The burn was of the so-called "third degree" throughout this region and has now healed entirely after a period of about eight months of active treatment, with the result shown in the two recent photographs, one giving the profile of the chin (Fig. 70), and the other showing the distance the chin can be separated from the sternum (Fig. 71) Although there are numerous small ridges of scar tissue, most of the scar is as soft and pliable as normal skin. Deforming contractures in this region can be and should be prevented.)

CLINIC OF DR. JOHN RIDLON

MERCY HOSPITAL

DIFFICULTIES IN THE DIAGNOSIS OF HIP DISEASE—A CASE OF OSTEO-ARTHRITIS

Summary: A patient with a history of recurrent attacks of pain and loss of function in the right hip for seventeen years; tuberculosis, osteo-arthritis, and hysteria to be considered; diagnosis made on the *x*-ray findings.

THE following case is unusual and interesting:

An unmarried woman, thirty-four years old, with a good family history. When about twelve years old was run over by a light wagon. She soon recovered and remained well for five years. Then, when seventeen years old, on turning over in a sleeping berth, something happened at the right hip and she was unable to walk. From this she fully recovered, and soon. Five years later she developed "spells" of being lame in the right leg, and she also had pain in the right knee. She would drag the leg when walking for a day or two, and then be better. In 1906 she became so lame that she took baths for "rheumatism."

In 1907 she went lame in May, and in July was put to bed, where she remained for six months. Had extension on the limb from September to Christmas. After that she wore a brace during the daytime and had weight and pulley extension at night. She used crutches for five years after the brace was removed.

During 1913 she had extension for three months and a plaster cast for twenty-three weeks. Then she considered herself practically well, but has used a cane, and the pain has been less. But she had a fall, and the hip became so bad that she could not walk. Again had extension. She had a temperature, and an abscess was feared. Again last year she had weight extension for a while and a plaster cast for nine months, up to last May.

Now "the limb is sore all the time," and there is pain. The pain does not waken her from sleep, and goes away when she rests the limb. She has some indigestion, but is not constipated. Has never had tonsillitis. Has tooth crowns and one bad tooth that "ulcerates," and aches when the hip aches. Never has had any great amount of leukorrhea. Looks well and is well covered with fat.

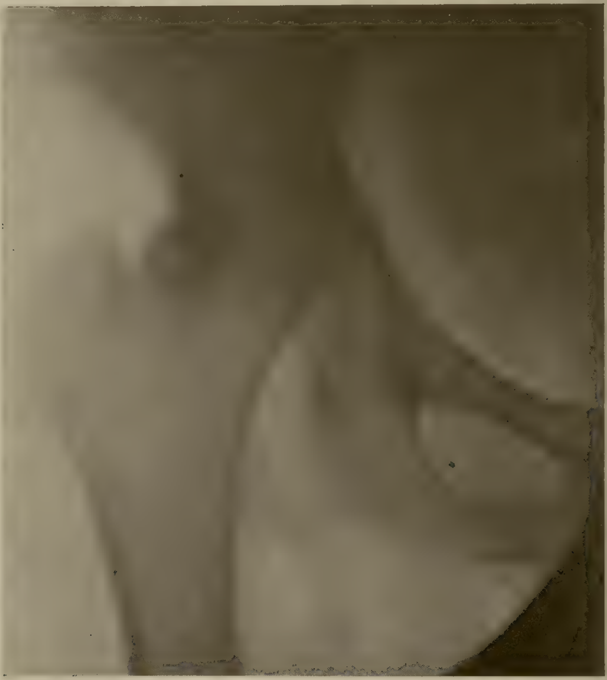

Fig. 72.—Diseased hip. Note changes in head and neck of femur and in the acetabulum as described in text.

Right leg is $\frac{3}{4}$ inch short; calf same size as left, but upper part of thigh is $1\frac{1}{2}$ inches smaller. There is no certain motion (passive) at the hip-joint, but she flinches at the least attempt at moving the limb, although she walks about the room without the cane and with no facial evidence of sensitiveness or suffering. There is no deformity at the hip.

The history of periodic attacks covering several years; the pain at the knee; the temperature and "abscess feared," strongly suggest a tuberculous hip. But the lack of atrophy of the calf, and particularly the absence of flexion and adduction deformity at the hip, warrant a doubt as to that diagnosis.

The bad (ulcerating) tooth suggests osteo-arthritis; but the long-continued periodicity of the symptoms and the lack of adduction deformity give reason for doubt.

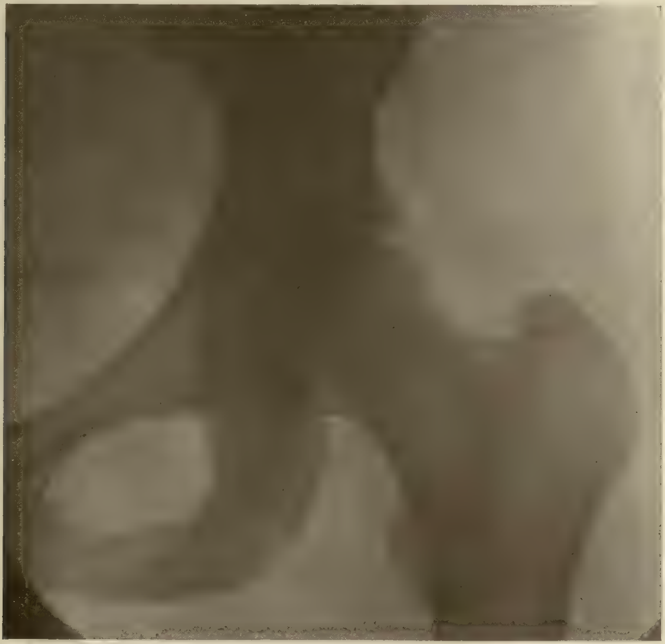

Fig. 73.—Radiogram of normal hip for comparison with Fig. 72.

The extreme sensitiveness to gentle attempts at passive motion when on the examining table, taken with the apparent lack of sensitiveness when walking around, suggest a hysteric hip, particularly in an unmarried woman thirty-four years old. But there should be no atrophy of the thigh with a hysteric hip.

The radiogram (Fig. 72) shows $\frac{1}{2}$ inch erosion into the upper border of the acetabulum, and at least two-thirds of the caput femoris destroyed. Deposits are seen along the upper border of the neck at least $\frac{1}{16}$ inch thick, and a similar deposit extending out from the border of the acetabulum, as if the capsule had been thickened and then calcified. (Compare with Fig. 73, the normal hip.) Doubtless a similar deposit is at both the front and back of the femoral neck, since some deposit shows below the neck. Radiograms of the teeth show three that must be removed and many requiring treatment.

From the *x*-ray findings we are warranted in the diagnosis of an osteo-arthritic hip.

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SURGICAL CLINICS OF CHICAGO

Volume 2 Number 2

CLINIC OF DR. ALBERT E. HALSTEAD

St. Luke's Hospital

THE SURGICAL TREATMENT OF FACIAL PARALYSIS

Summary: Indications for surgical treatment; spinal accessory—facial anastomosis; development of the operation; historic sketch; technic in present case.

Case History.—Mrs. H., aged forty-eight, housewife. Four months ago was operated on for chronic mastoid infection. During this operation the facial nerve was injured. Immediately following there was complete unilateral (left) facial paralysis. Since then there has been not the slightest improvement in the paralysis. The mastoid wound has completely healed.

The history of this case, except that relating to a chronic middle-ear disease ten years ago, which was followed by increasing dizziness and vertigo with pain referred to the mastoid region, is negative. It was for the relief of these symptoms that a radical mastoid operation was done.

Physical examination reveals nothing abnormal except the scars resulting from healed varicose ulcers of both legs, also scars showing excision of superficial veins of both legs. This operation was done in this clinic four years ago, with resulting cure of the ulcers.

There is also complete unilateral facial paralysis. There is absolutely no reaction to electric stimulation of the muscles either direct or through the nerve trunk. No improvement has followed the treatment which has been employed since the onset of the paralysis. We are, therefore, led to assume that the nerve has been divided, and that there is no hope of recovery unless nerve impulse can be secured by grafting the peripheral trunk of the facial distal to the point of division upon the central portion of a normal nerve trunk, which is of less physiologic importance and, therefore, may be sacrificed.

We have in this case selected the spinal accessory nerve for anastomosis.

Historic.—In 1898 Dr. Faure, of the Hospital Laennec, made the first attempt to restore the function of a paralyzed facial nerve by dividing a neighboring motor nerve and uniting its central trunk to the paralyzed peripheral portion of the facial. His patient suffered from paralysis of the facial due to an injury to the nerve in its course through the temporal bone. The paralysis had lasted for eighteen months. The facial was divided near the stylomastoid foramen, and united to the divided central portion of that portion of the spinal accessory nerve that supplies the trapezius muscle.

Although this operation was not followed by a brilliant result, yet through frequent reference to it in the literature it seemed to attract attention to a procedure which was later employed with success in a considerable number of cases.

This case also led to a series of experiments on lower animals by a number of different investigators, which has placed nerve transplantation and nerve anastomosis on a sound scientific basis. Among those who early took up this line of investigation we may mention Manasse, in Germany, and Barrago-Ciarella, in Italy. The latter was able to report three successful anastomoses of the facial to the accessories in dogs. In a fourth case the central end of the vagus was united with success to the peripheral portion of a divided facial.

In 1900 Robert Kennedy, of Glasgow, divided the facial in a case of severe facial spasm, and immediately united the peripheral portion to the central end of a completely divided spinal accessory. Complete restoration of function of both groups of muscles, temporarily paralyzed by the section, followed.

In 1902 Cushing united the cut facial to the central end of the divided spinal accessory in a patient whose facial nerve had been paralyzed from a gunshot wound involving the right mastoid process. In this case complete success was recorded. The report made two hundred and eighty-seven days after the operation describes the electric reactions as practically normal to faradic and galvanic stimulation when applied directly to the muscles and indirectly through the nerves. Individual co-ordination movements were found to be under good control. The eye could be kept almost completely closed, the lower facial muscles were active. The volitional control was effected without associated shoulder movements or contraction of other facial muscles. There was, however, some asymmetry remaining.

The report of this successful case did much to establish the operation of facial anastomosis in this country. In 1903 a successful anastomosis of the facial to the hypoglossal was done in this clinic. The patient at the end of one year was examined. The control of the facial muscles was complete. There was only slight co-ordinate movements of the tongue. The facial expression was good. In this case the lesion of the facial nerve had been caused by a bullet wound of the temporal bone. The bullet had entered the right external auditory meatus, traversed the external auditory canal, entered the tympanic cavity, passing downward and forward, and lodging close to the body of the third cervical vertebra.

Surgical Procedure.—In this operation we may adopt the method of anastomosis first proposed by Leviesant, employing the central end, in its entirety, of a motor nerve known to have a normal central connection, or we may employ only a part of the severed nerve in making the union to the peripheral portion of the paralyzed nerve, as was done by Kennedy, who preserved a part of the nerve supply to the trapezius and sternomastoid. It may be said that an attempt to unite only a part of the spinal accessory to the facial would undoubtedly lessen the chance of securing the success of the operation and increase the difficulty of dissociation of co-ordinate shoulder movements. With certain conditions present it may appear to the operator that anastomosis of the hypoglossal with the facial is preferable to the union of the accessory with the facial. In the hypoglossal we have a longer nerve trunk and one that under ordinary conditions may be more easily identified. However, there is generally no difficulty experienced in the exposure and identification of the spinal accessory.

In this operation, as in all operations on the peripheral nerves, success depends largely on the care with which the tissues are handled, causing a minimum amount of traumatism and, consequently, a minimum quantity of scar tissue in the healing process:

1. The field of operation should be dry
2. Excessive sponging or crushing of tissues should be scrupulously avoided.
3. The nerves should be isolated without handling them.
4. The division of the nerve trunks should be made with sharp cutting instruments.
5. The union of the divided ends should be accomplished by accurate approximation and by fixation with a minimum number of sutures. These should be of the finest suture material, preferably silk.

It goes without saying that the nearer the stylomastoid foramen the facial trunk is divided, the less danger there is of tension on the nerve suture. As the nerve lesion causing the paralysis is generally within the temporal bone, division close to the point of exit from the mastoid is generally possible. Chipping off the tip of the mastoid and reflecting this divided portion with the attached sternomastoid gives access to the nerve close to the stylomastoid foramen. At this point, just posterior and below the lobe of the ear, the nerve, emerging from the mastoid above the posterior belly of the diagastric muscle, may be easily identified. Passing below the digastric and the posterior auricular, posterior to the facial, lying upon the internal jugular vein, is the spinal accessory. Doubt as to the identity of this nerve is removed by slightly irritating the nerve, whereby a movement of the shoulder is brought about. The nerve should be divided close to the point of entrance into the sternomastoid, the central end turned upward and united above the digastric to the facial trunk (Fig. 74). The united nerves at the point of union should be enclosed in a thin covering of subcutaneous fat and areolar tissue. The wound is cleansed by washing with decinor-

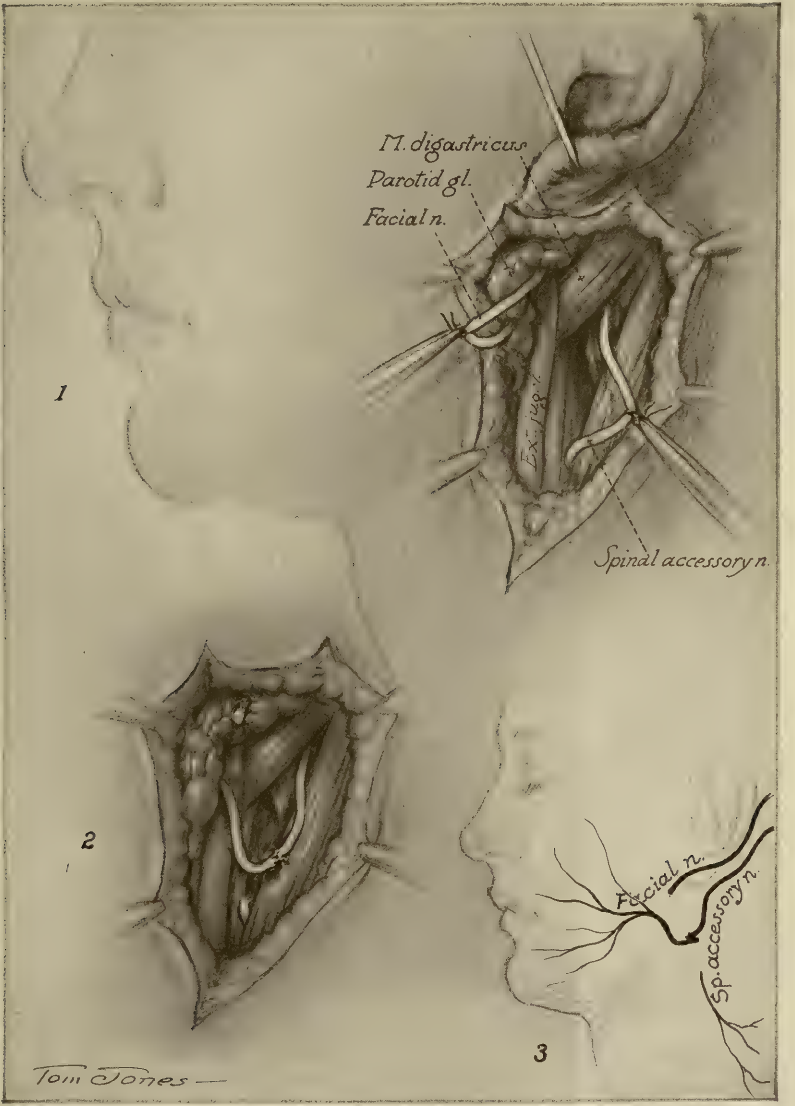

Fig. 74.—Anastomosis of facial nerve with spinal accessory.

mal salt solution. The tip of the mastoid is replaced and held by a catgut suture through the periosteum, the fascia closed by catgut sutures, and the skin by silk or silkworm-gut.

CLINIC OF DR. ALBERT E. HALSTEAD AND DR. GEORGE F. DICK

ST. LUKE'S HOSPITAL

A CASE OF SYRINGOMYELIA WITH ARTHROPATHY

Summary: The diagnosis of syringomyelia—importance of demonstration of characteristic sensory changes; pathology of Charcot joints—most cases precipitated by trauma—diagnosis; treatment of but little avail.

THE patient whom I present to you this morning speaks no English, but we have obtained the history of his illness through an interpreter. I shall read the history and demonstrate the important points in the physical examination quite in detail, because the case is typical of the conditions found in the majority of patients with syringomyelia who develop neuropathic joints, and will, therefore, repay us for the close study which we purpose to give.

HISTORY

Present Complaint.—1. Swelling of right elbow.

2. Loss of strength of right forearm and hand.

The present complaint dated back ten weeks, at which time the patient was struck on the right elbow with an iron gear while at work. The elbow began to swell immediately, but the patient continued to work for the next three days, during which time the elbow pained him but little. On the third day his whole forearm began to swell down to and including his fingers. This swelling persisted for two weeks, when it started to go down, first in the hand and later in the arm. During the first four weeks of the period of acute swelling the arm was very painful and tender. For the last six weeks it has remained about the same size, and is not tender to pressure or painful on movement. The hand has remained cold and blue ever since the swelling went down, and has become practically useless because of the marked loss of power which has supervened in the muscles of the forearm and hand. For several weeks there has been a crackling noise in the joint on movement.

Past History.—Denies venereal; never sick.

Habits.—Bowels constipated; appetite poor; sleeps fairly well; moderate drinker.

Family History.—Father and mother dead, cause unknown. Married; eight children; three dead, five living. No tuberculosis or cancer in family.

PHYSICAL EXAMINATION

General.—The patient is a slightly built Pole thirty-nine years of age. His general appearance is that of fair health.

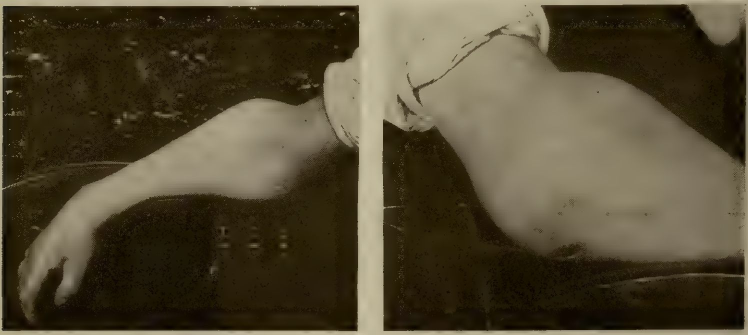

Fig. 75. Fig. 76.

Figs. 75 and 76.—Neuropathic arthropathy of elbow in case of syringomyelia.

Head and Neck.—The head and neck are negative. There are no scars on the scalp. The ears, nose, and throat are normal. The pupils react to light and accommodation, and are regular and equal. The teeth are in poor condition from neglect, covered with tartar. The skin of the head and neck are normal with respect to heat and cold, touch, and pain sensations.

Chest.—The heart and lungs are normal.

Abdomen.—The abdominal wall is the site of numerous atrophic scars from burning. Some are fresh, others are white with cicatricial tissue. There are several similar scars on the back. There is marked scoliosis to the right in the lumbar region.

No tumor masses are present in the abdomen; there are no areas of tenderness.

Extremities.—The extremities are normal with the exception that there is evidence of an injury, with deformity of the right elbow. It is swollen two to three times its normal size and the tumor mass fluctuates (Figs. 75, 76). Crepitus is elicited upon manipulation, but there is no pain. Patient is able to operate the arm, but is unable to flex it. There is slight atrophy of leg and arm muscles.

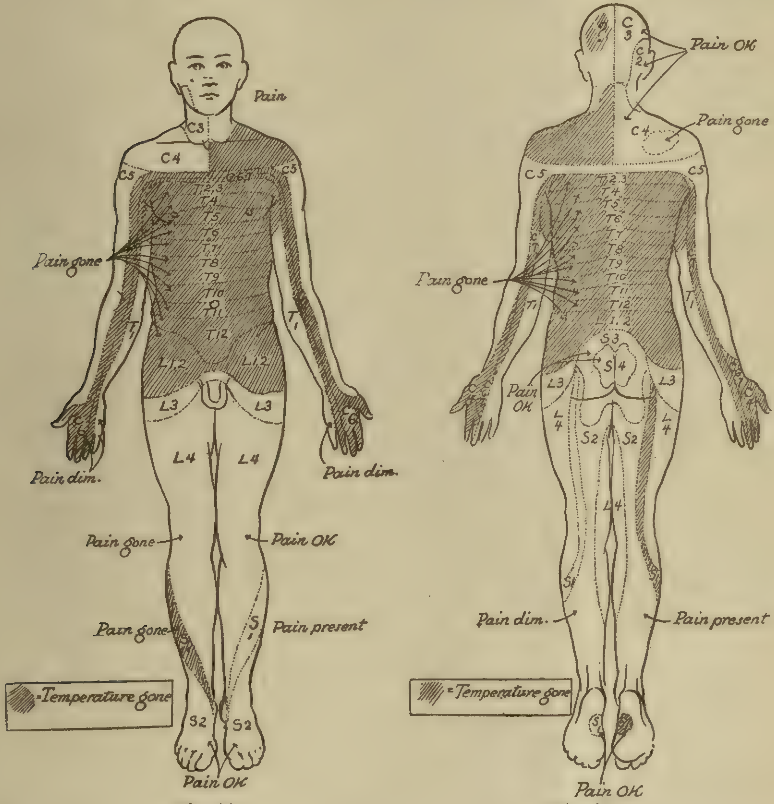

Fig. 77. Fig. 78.

Figs. 77 and 78.—Diagrammatic representation of cutaneous sensory changes found in present case of syringomyelia.

Lymphatics.—No adenopathy.

Nervous.—The patient has a markedly spastic gait. The pupils react normally. The triceps tendon reflexes in both arms are exaggerated, as are also both patellar and Achilles' reflexes. There is a marked ankle clonus on both sides and typical Babinski reflex on both sides. Cremasteric and abdominal reflexes cannot be elicited.

Examination of cutaneous sensibility reveals a very interesting condition. If I take a sharp pin, a wisp of cotton, and two test-tubes, one filled with hot water and the other with cold, and test the skin at various points with regard to the effect of these agents, I find that I can map out definite areas in which the pirck of the pin and the differences between the hot and cold tube cannot be distinguished, while the very delicate irritation of the wisp of cotton is readily perceived. These areas are, for the most part, symmetric except the legs, and correspond precisely to the distribution of certain of the spinal nerves. This condition is graphically shown on these charts, which have been constructed to illustrate the dissociation of heat and cold and pain from touch sensation in this particular case. You will note the absence of the pain and temperature sense over the entire trunk and in certain limited regions, which tend to be symmetric and correspond to the distribution of certain spinal nerves on the arms and legs (Figs. 77, 78).

Genitalia.—Negative.

LABORATORY REPORTS

Blood analysis: Wassermann negative.
  Eryth., 4,750,000.
  Leu., 7000.
  Hb., 90 to 95 per cent.
Differential: Lymphocytes—
    Small, 24 per cent.
    Large, 14 per cent.
    Indentate, 4 per cent.
  Eosinophils, 4 per cent.
  Large mono., 2 per cent.
  Polymorph., 50 per cent.

Spinal fluid—
  Bloody.
  Wassermann negative.
Urine negative.

x-Ray Report.—Fracture of bones in elbow with callus formation. Exudate about joint. Charcot joint.

The case is one of typical syringomyelia with Charcot joint.

The cause of syringomyelia is unknown, although numerous possibilities are suggested. It is possible that inasmuch as the pathologic anatomy varies in different cases, a common cause will not be found.

The disease has been found in individuals with congenital deformaties, such as spina bifida. It is more common in men than in women.

The pathologic anatomy is that of a proliferation of glia cells about the central canal of the cord with degenerative changes and hemorrhage. Cavity formation occurs in these areas. The cervical cord is most commonly affected or the upper cervical cord and lower one-third of medulla. In the cervical cord the gray matter of the cord is uniformly encroached upon. In the lower dorsal and lumbar segments the posterior horns and posterior columns are oftener affected. The anterior lateral columns and anterior cornua may be affected or the posterior lateral columns and posterior cornua.

Schlesinger distinguishes four clinical types of disease:

1. The classical type, beginning in the cervical region.
2. A motor type, beginning similarly to amyotrophic lateral sclerosis.
3. Predominating sensory disturbances.
4. Pronounced trophic disturbances (Morvan's disease).

Dejerine adds: (1) a bulbar, and (2) a tabetic type. According to Cramer, 20 to 80 per cent. of syringomyelia cases show spinal curvatures, such as are present in this case. The curvature is not due to arthritis, but probably to weakness of the spinal muscles.

The pathology of the joint affection in syringomyelia is identical with that of tabes dorsalis. In syringomyelia 80 per cent. of the joints affected are found in the upper extremity. The reverse of this is true in tabes, *i. e.*, about 80 per cent. of the joints involved being of the lower extremity. In syringomyelia the shoulder-joint is most frequently diseased.

In syringomyelia we find, as in tabes, hypertrophy and hyperplasia of the peri-articular tissues; effusions into the joint cavities; exostoses and hyperostoses of the articular ends of the bones.

The *x*-ray shows, in these cases, detached portions of bone from the articular surfaces of the joint, with great thickening of the peri-articular structures. We also find, as in this case, changes in the muscles about the joint, which are identical with myositis ossificans. In the case before you the *x*-ray clearly shows bony deposits in the brachialis anticus and in the triceps muscles.

We also find in this case a pathologic dislocation, the bones of the forearm being dislocated backward. This is an uncommon finding in the *elbow*-joint in syringomyelia. In the shoulder it is common.

The disease in this case, you will note from the history, followed a trauma. This is usual in neuropathic joint lesion's In the beginning the joint is usually painful. Pain begins, as a rule, as the apparent result of some injury, so that the joint affection is commonly regarded, for at least a time, as traumatic. If the course of the disease is watched, it will be noted that the pain gradually subsides until we have before us, as in this case, a joint showing extreme changes without any or perhaps but little pain. This is characteristic of neuropathic joints both in tabes and in syringomyelia.

TREATMENT

There is no known remedy for the underlying disease of the cord which is responsible for the joint condition.

Local treatment of the joint lesion is unsatisfactory. Puncture with evacuation of the effusion gives temporary relief, but seldom gives a useful joint. Incision and drainage offer some hope of benefit. In a few cases the wound heals, the joint tissue becomes retracted, and improvement is brought about. In other cases healing of the incision is delayed. The wound suppurates and the condition may be made worse than it was before the operation. In this case we will puncture the joint with a large trocar and evacuate the fluid from the joint cavity.

Operation.—The elbow and arm were painted with one-half strength iodin and washed with alcohol. A large aspirating needle was then introduced and a bloody fluid aspirated. The wound was closed with collodion dressing.

CLINIC OF DR. DALLAS B. PHEMISTER

Presbyterian Hospital

BONE TRANSPLANTATION FOR REPAIR OF DEFECTS OF THE MANDIBLE

Summary: Reconstruction of the anterior portion of the mandible in a case operated on six months previously for central fibroma; technic; behavior of bone transplants in infected fields; upper end of tibia the ideal source of transplants for repair of defects of the lower jaw involving more than the body of the bone.

December 22, 1917.

This patient (Figs. 79, 80) was operated on September 15, 1916, for a central fibroma of the mandible. The entire anterior portion of the mandible, except the alveolar process, and a considerable portion of the left side of the ramus, were removed. (The Surgical Clinics of Chicago, February, 1917.) At the time of operation the mucous membrane of the mouth was opened, exposing the wound to infection. For this reason a transplant for the repair of the defect was not introduced immediately. The wound subsequently became infected and discharged for four or five weeks, but healed without the escape of any necrotic bone and without the loss of any of the front teeth, the roots of which were all but exposed by the removal of the tumor. Six months after the wound had healed the patient came back for repair of the marked deformity resulting from the loss of substance in the mandible (Fig. 81).

Examination failed to reveal any evidence of recurrence of the tumor. The operation was performed by exposing the area through the original incision, which was considerably scarred as a result of the infection. The bone was exposed and its surface was found to be rounded off by newly formed bone without any evidence of recurrence of the tumor. This bony surface was freshened where it was to come in contact with the transplant.

In searching for a location from which a horseshoe-shaped transplant could be obtained for the repair of this defect the anteromesial aspect of the upper end of the tibia seemed to be the most favorable, as it affords a broad flat surface from which such a transplant can be cut. A flexible probe was molded into the shape of the defect, which was horseshoe shaped and about ½ inch longer on the left side than on the right. Consequently, the rami of the transplant were cut slightly oblique from the upper tibial surface in order that the left one might extend backward on the tuberosity of the tibia and so be made longer than the right (Fig. 82, 4). A U-shaped mass of bone was thus removed by means of the motor saw, the thickness of the ends being increased by cutting beyond the margins of the surface both posteriorly and anteriorly (Fig. 82, 5, 6). The central portion was cut away

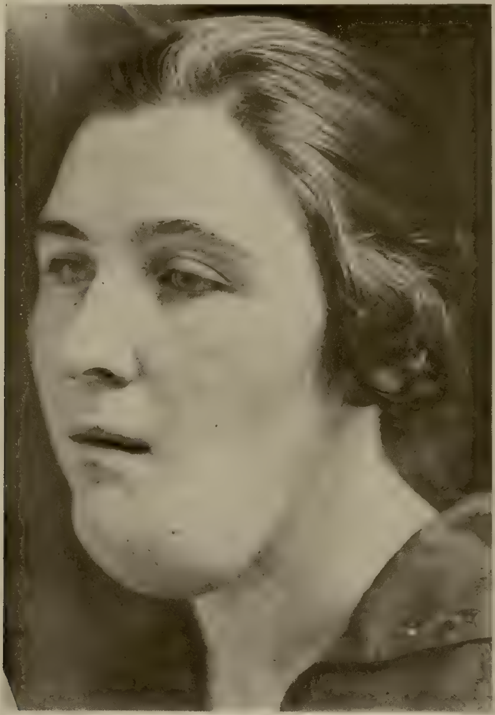

Fig. 79.—Central fibroma of jaw.

with the motor saw after removing the U-shaped mass, while the bone was firmly held by means of the bone-holding forceps. The transplant was fitted into the defect after trimming away the prominent portions of the endosteal surface (Fig. 82, 7, 8), and was firmly held in position by the soft parts which were placed under considerable tension as a result of its introduction. Two or three catgut sutures were passed, anchoring the transplant to the soft parts of the mandibular region. The wound was closed without drainage. As nearly as I could tell the mucous membrane

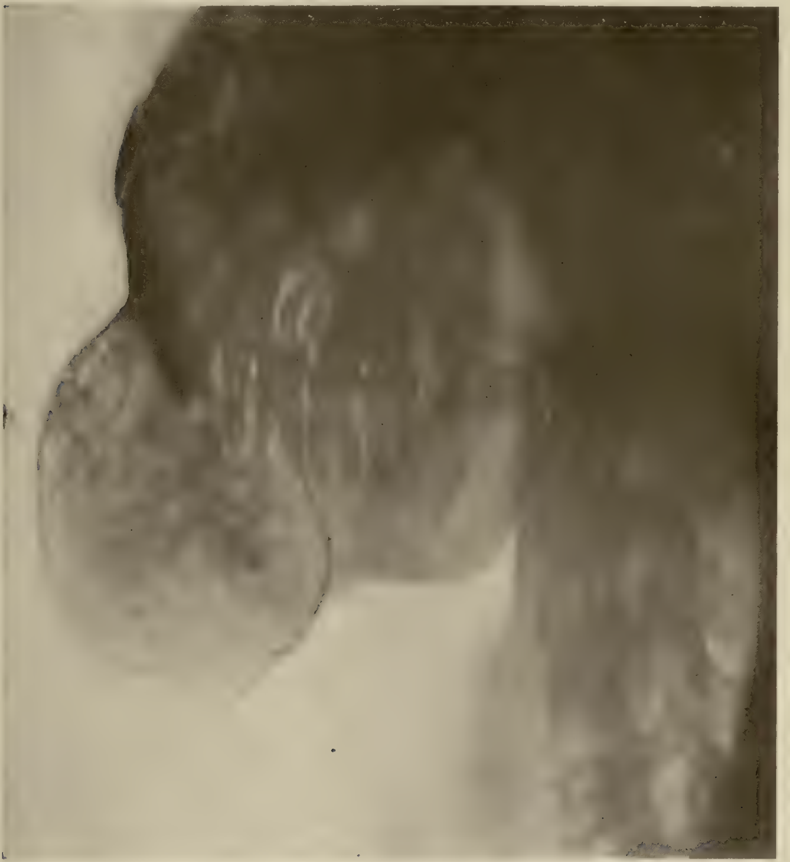

Fig. 80.—Central fibroma of mandible. Note the shadows suggestive of bony trabeculæ dividing the interior of the tumor into numerous cavities.

of the mouth was not opened, but, unfortunately, infection occurred again. A stitch was removed on the right side and pus escaped, after which a drain was introduced.

The wound discharged quite profusely for some time and necrotic bone could be felt by means of a probe. Removal of the infected transplant was considered, but knowing from my experimental work on animals that infection of the transplant may occur without killing all of its osteogenetic elements, I decided to wait and see if some of it would not live and if the portion which died would not become separated as a sequestrum. After the acute infection was over the wound continued to discharge, and in the course of the five months which have followed the operation has opened and closed a number of times, but without escape of the necrotic bone. During all of this time a probe introduced

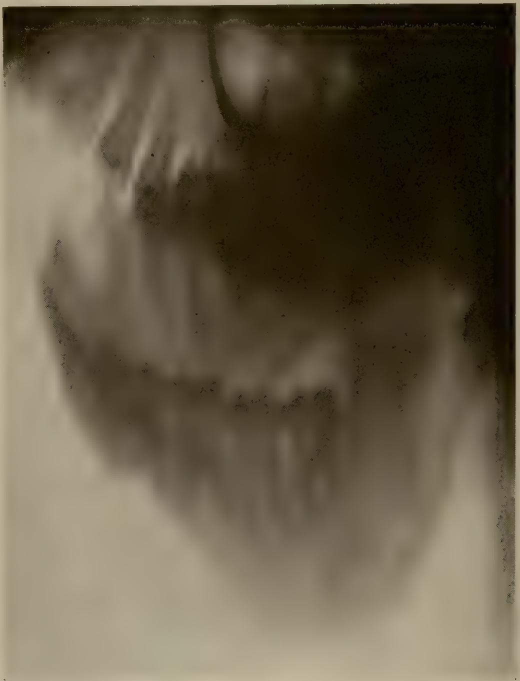

Fig. 81.—Roentgenogram of jaw after operation, showing the extent of the bony defect.

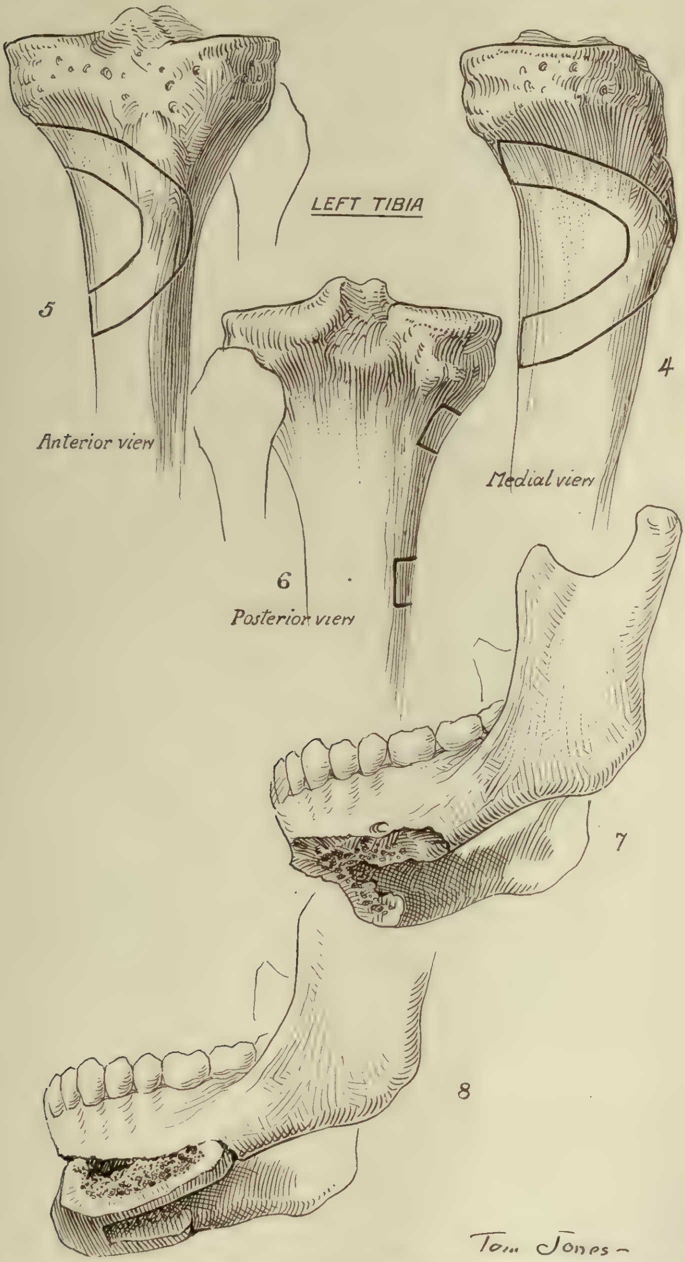

Fig. 82.—4–8. Transplant outlined on tibia, removed, and fitted into defect in jaw.

into the fistula revealed the presence of dead bone. x-Ray examinations made at intervals of about six weeks have shown very interesting changes going on in the transplant (Fig. 83, six weeks after operation). Practically all of the compacta of the transplant underwent necrosis, but the unossified osteogenetic elements along the surface of the anterior portion, which did not become necrotic, have formed considerable new bone similar to the new bone formation which appears as an involucrum about dead bone in osteomyelitis. This involucrum became attached in position as the sequestrum loosened up, so that at the end of five months the latter was removed in fragments through the slightly enlarged fistulous opening. Since removal of the portion of the transplant which became necrotic the wound has healed and you see that a very satisfactory chin has been formed

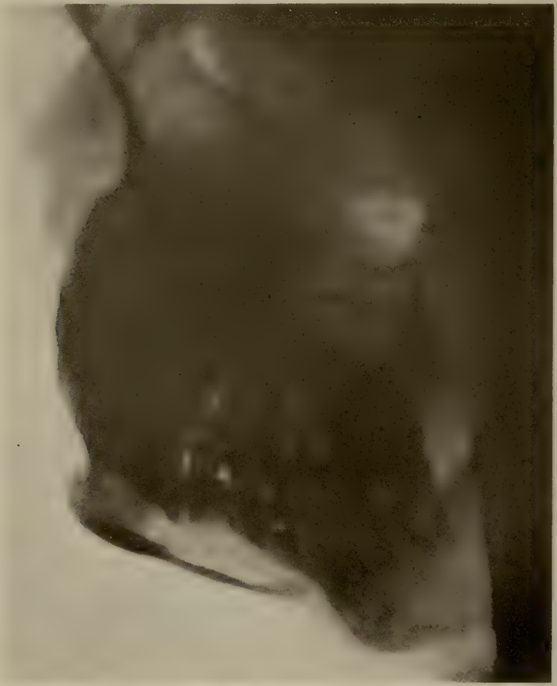

Fig. 83.—Roentgenogram of region of defect six weeks after insertion of tibial transplant.

(Fig. 84). Of course the result would have been better had infection not resulted, but its presence has brought out a very interesting fact with which we frequently have to deal in connection with bone transplantation.

A study of transplanted bone shows that in the absence of infection the ossifying osteogenetic elements of the transplant located along the periosteal and endosteal surfaces and in the porous spaces and vascular canals of the bone substance survive, while the cells of the compact bone located in lacunæ and connected with the exterior by very small canaliculi receive insufficient nutrition and undergo necrosis. The subsequent changes

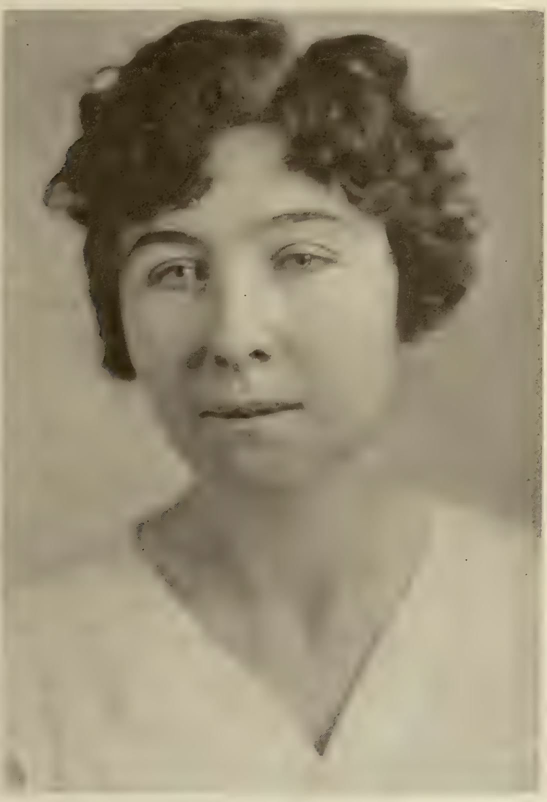

Fig. 84.—Result after complete wound healing.

in the transplant are somewhat as follows: The surviving osteogenetic elements proliferate and form new bone which unites the transplant in its position and gradually replaces the aseptic necrotic bone of the compact substance as it is slowly absorbed. This process is known as "creeping substitution" of necrotic bone by new bone.

When infection develops about a transplant the subsequent changes which go on in it are very much altered, depending to a considerable extent upon the severity of the inflammatory reaction. If it is severe, the entire transplant, including all of the osteogenetic elements which ordinarily survive in an aseptic field, may undergo necrosis, so that the transplantation is a complete failure. If the infection is mild, only a portion of the transplant may become separated as a sequestrum, and the osteogenetic elements of the remaining parts may survive and proliferate, forming an involucrum about the remaining cortex, such as occurs in osteomyelitis. In this event transplantation is not a complete failure, as the portion which separates as a sequestrum may be discharged and the resulting involucrum may fill out the defect in a fairly satisfactory manner, as illustrated in this case. Consequently, we cannot say that infection in bone transplantation necessarily spells disaster, and should not be in too great a hurry to remove the transplant, as it may serve its purpose despite the infection and loss of a portion of its substance. Had I not known of this occurrence the transplant would probably have been removed at the end of a week or ten days, when it looked very much as if the operation were a failure.

Since the performance of this operation I have experimented on cadavers as to the possibility of obtaining curved transplants from the upper end of the tibia for the repair of defects of the jaw of various shapes and sizes, and have found it to be the most satisfactory region from which to obtain such material. The transplant can be so cut as to fill in a defect of almost any portion of the body and a considerable portion of the ramus of the jaw. Where the anterior portion of the mandible has been destroyed either in part or *in toto*, a transplant can be cut transversely from this surface, but where the defect is greater on one side than on

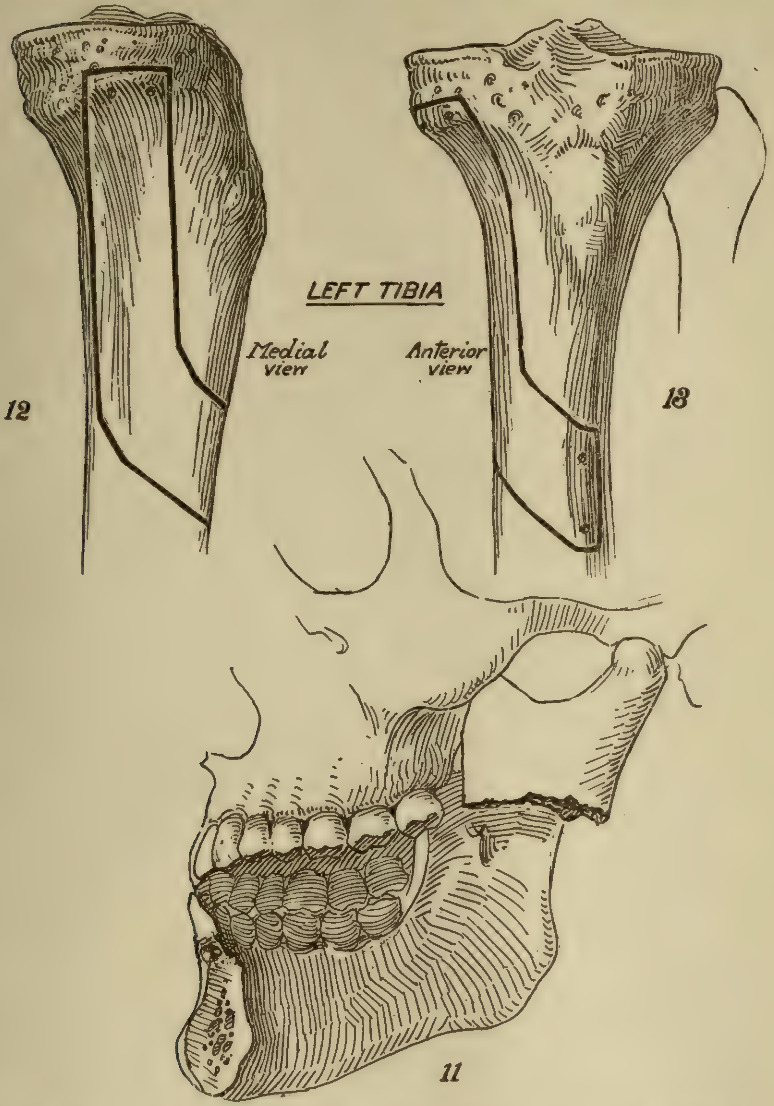

Fig. 85.—11–13. Outline of scheme for the utilization of bone from the upper end of the tibia in the repair of extensive defects of the mandible.

the other, a long ramus can be obtained by cutting it obliquely, and the long arm should always be placed above, as the expanded

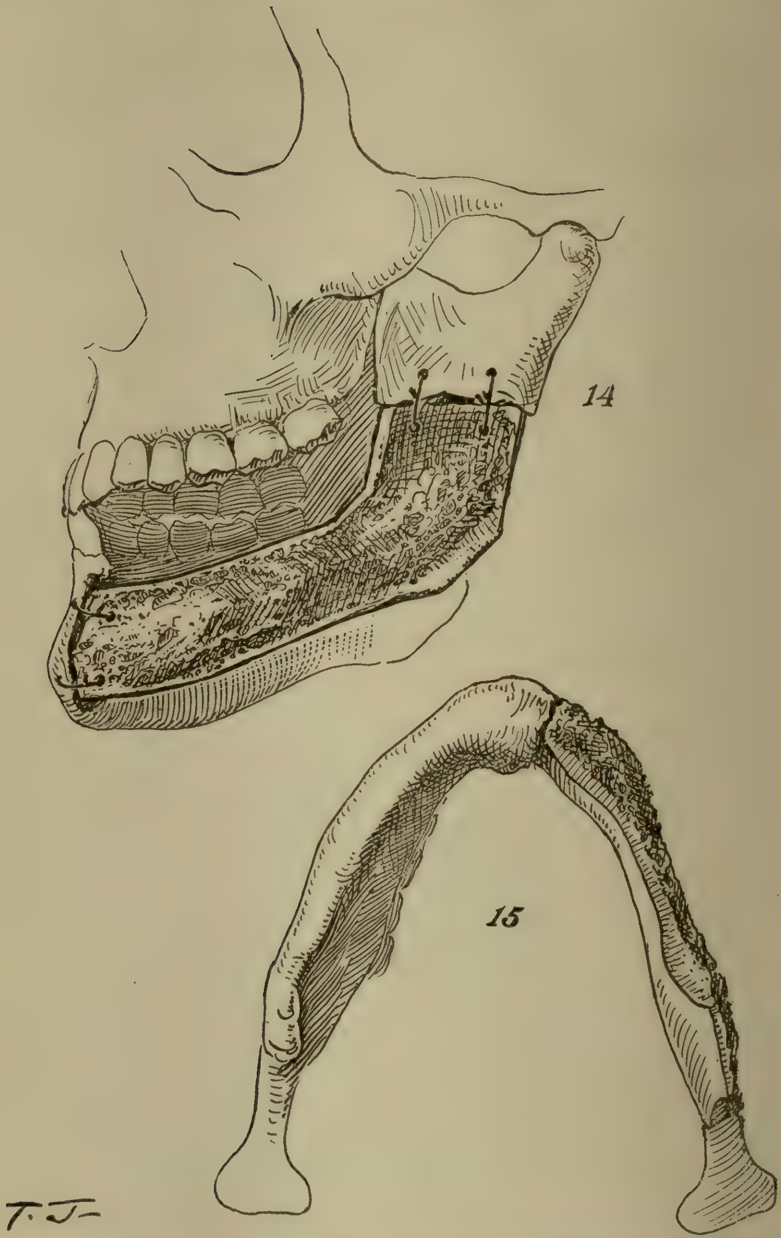

Fig. 86.—14, 15. Outline of scheme for the utilization of bone from the upper end of the tibia in the repair of extensive defects of the mandible.

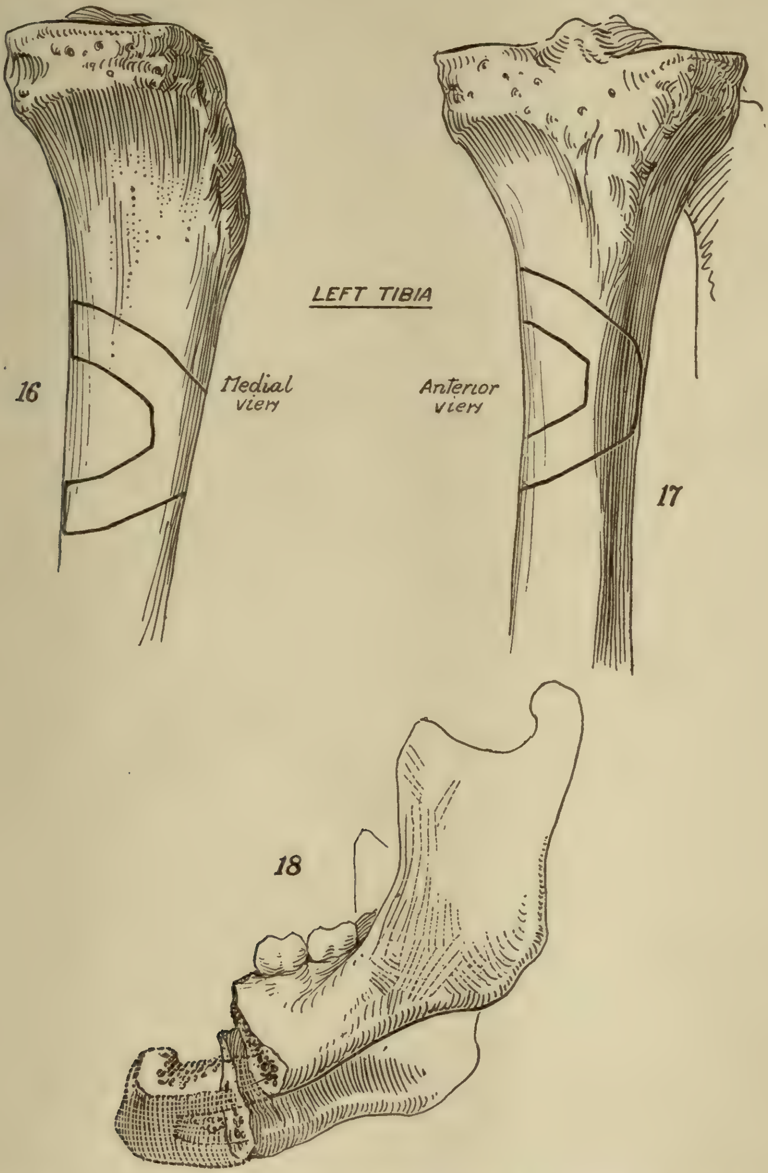

Fig. 87.—16–18. Outline of scheme for the utilization of bone from the upper end of the tibia in the repair of extensive defects of the mandible.

condyles afford a greater surface from which it can be obtained. If the long side of the transplant is to be placed on the left side, the right tibia should be used, but if on the right side, the left one, as the periosteal surface should be placed downward in either case. The cuts into the bone should be carried deeply in order to give as much depth as possible to the newly formed ramus. The portion which comes from the tuberosity should include the trabeculated bone to a considerable depth. Where half of the body and a portion of the ramus of the jaw have been destroyed or removed, as is frequently the case in excision for sarcoma or carcinoma, the defect can be repaired by a transplant, the body of which is cut longitudinally from the posterior mesial portion of the upper end of the tibia and the anterior curvature obtained by extending it well up on to the expanded condyle to within 1 cm. of the end of the bone. The portion of the ramus can be obtained by extending the lower end transversely across the bone to the tibial crest (Figs. 85, 86). Such a transplant is fitted into the defect with the periosteal surface inward. It can be easily cut with the motor saw. In order to prevent splitting the transplant by attempting to make them after it has been taken out, one or two holes for fixation should be bored at either end before removal of the transplant from its bed. Where the body of the mandible alone is to be repaired, a very satisfactory transplant can be obtained from the posterior portion of the seventh or eighth rib, taking advantage of the normal curvature in this region, but a single transplant which will fill out a defect of the body and a portion of the ramus of the mandible cannot be obtained from the rib. Figure 87 illustrates the repair of a complete defect of the anterior portion of the jaw.

CLINIC OF DR. ROGER T. VAUGHAN

Cook County Hospital

ACUTE OSTEOMYELITIS OF THE STERNUM: WOODY PRESTERNAL PHLEGMON: OSTEOTOMY AND DRAINAGE.

Summary: A patient presenting a firm, board-like, inflammatory swelling over the upper and middle portions of the sternum, and giving a history suggestive of an acute pyogenic infection of bone; diagnosis: perforating aneurysm, tuberculosis, carcinoma, and mediastinal abscess ruled out; osteomyelitis of the flat bones—incidence and clinical picture; operative management in present case—incision and light gauze packing, no sutures; complications of osteomyelitis of sternum—progressive necrosis of costal cartilage, mediastinal invasion, pyemia.

The patient is an Austrian Pole who has been working as a molder in an iron foundry. He is twenty-six years of age and married. He entered the hospital on June 23, 1917, at 11 A. M., on the service of Dr. Joseph L. Miller. The patient speaks no English and his history had to be obtained through an interpreter, not without considerable difficulty.

Six days ago, June 17th, the patient first noticed pain in the front of his chest. It came on gradually, without chill. It was referred to the region of the upper sternum and has been constant, dull and throbbing in character, and has been growing steadily worse since the onset. The day before yesterday, June 21st, the patient first noticed some swelling in the region of his upper sternum. This swelling has been gradually increasing since then. The pain, too, has become more intense since the swelling appeared. The patient gives no history of an injury except that in his work he sometimes pushes heavy objects with his hands and chest. He was not aware of any other illness immediately preceding the present attack. He has had no previous or similar attacks which confined him to bed. He denies venereal infection, Neisserian or luetic. He has been married five years. His wife and three children are living and well. No children dead and no miscarriages.

Examination shows a muscular and robust young white male. Over the upper and middle portion of his sternum there is an almost symmetric swelling (Fig. 88). It is elevated 1 or $1\frac{1}{2}$ cm. above the level of the chest, is tender, slightly reddened, not at all edematous, firm and board-like, with no fluctation demonstrable. It is approximately circular or slightly oval in its longest diameter. Its exact borders are not well defined. Over the center of the swelling is a point of exquisite tenderness, though the entire swelling is somewhat tender. Percussion gives a slightly dull note. The heart-tones are heard through the swelling without difficulty.

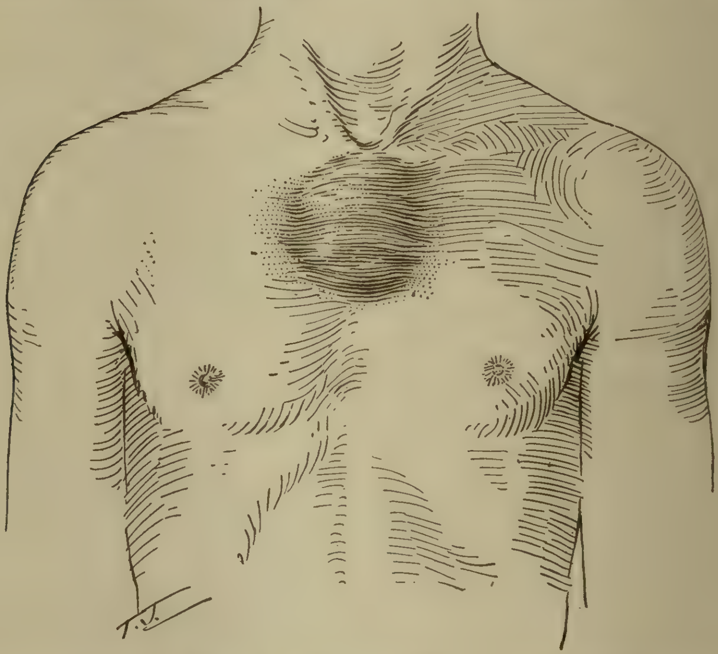

Fig. 88.—Location and extent of "woody phlegmon" overlying osteomyelitic focus. The swelling is very hard, red, and tender.

Examination of the heart and lungs is negative. No increase in mediastinal dulness; no enlargement of the veins of the chest or neck; no edema of either extremity or of the face; no bruits over the aorta, in the sternal notch, or along the carotids. The temperature in both hands is alike; no difference in pulses. Pupils equal and react to light. Voice not hoarse; no tracheal tug; no enlarged cervical, supraclavicular, or axillary glands.

Abdominal examination is negative. No enlargement of the liver; no increase in tympany, no rigidity or dulness in the flanks; no edema of the legs or scrotum. Physical examination is otherwise negative.

Temperature on entrance to hospital 101.4° F. rectally, pulse 86, respirations 20. The nurse records that the patient complains of headache and does not seem very acutely ill.

Urine examination is negative. It is clear; specific gravity 1020; acid reaction; no albumin or sugar or cellular elements. White count made the same afternoon shows 17,600 leukocytes to the cubic millimeter.

A diagnosis of acute osteomyelitis of the sternum was made by the medical service, and this diagnosis was concurred in by Drs. W. W. Hamburger and R. T. Vaughan, who were called to see the case. The man was accordingly transferred to the surgical service for immediate operation.

COMMENTS

This case is interesting from both a pathologic and a diagnostic standpoint. Acute osteomyelitis of the flat bones, while unusual, is not so rare that one should be surprised at seeing a case. For instance, I have had 2 cases of acute osteomyelitis of the ilium on my County Hospital service at the same time. Of course the sternum is less frequently involved than the ilium, but the symptoms of osteomyelitis are usually so clear cut that one should recognize them with comparative ease wherever found.

In making a diagnosis of acute osteomyelitis the *history* is very important. From this patient we can obtain no satisfactory history. He speaks no English whatever. Through the Polish interpreter we tried to get a statement as to antecedent acute focal infection, such as coryza, bronchitis, furuncle, or the like; but while the two Poles held an animated and vociferous conversation for some time as we waited, no definite data were elicited.

The *onset* of the acute osteomyelitis in this case seems to have been fairly typical. There was no preliminary chill, but chill is often absent in osteomyelitis of the flat bones, particularly where only a portion of the bone is involved, so-called "focal osteomyelitis." The marrow of flat bones is less vascular than that of the long bones, and consequently there is less septic absorption. The suggestive joint symptoms usually found in osteomyelitis of the long bones are not present in acute osteomyelitis of a rigid flat bone like the sternum; but pain, gradually growing in severity, dull and throbbing in character, and, finally, the appearance of a firm woody swelling over the middle of the sternum, tender and slowly increasing in size and accompanied by high fever and high leukocyte count, present a picture which can scarcely be confused with any other acute lesion in this location.

The location of the swelling, together with the throbbing character of the pain, led one doctor to think of the possibility of a perforating aneurysm. This possibility is easily ruled out. Although the patient feels a throbbing, referred to the swelling, there is no visible (or palpable) pulsation over the latter, even with the aid of the paper test. There is no bruit to be heard over the sternum nor elsewhere over the chest. Perforating aneurysm in this location would have to come from the ascending arch of the aorta, fairly close to the aortic valves. An aortitis in this location, of necessity, is almost always associated with aortic regurgitation; but there is none here. As I said, there are no bruits over the heart area nor is the heart enlarged, the apex-beat lying in the fifth interspace inside the nipple line. There is no increased dulness over the upper sternum, as with a dilated aorta, and no pulsation in the episternal notch. Furthermore, if we were to diagnose a perforating aneurysm, we should have to explain this man's fever and leukocytosis by assuming the existence of an accompanying inflammatory lesion. There is no evidence of more than one lesion. Of course, we could have a Wassermann test made, but it would take time. This is an urgent case and unnecessary Wassermanns increase laboratory expense. The diagnosis is quite certain without it, even though this were a man in the "aneurysm age," instead of being only twenty-six years old.

By "aneurysm age" I do not mean that a man of twenty-six cannot develop a syphilitic aneurysm, but it is unusual. I saw a patient only twenty-eight years old only a few weeks ago with a small abdominal aneurysm which ruptured and caused death within less than an hour. The patient came to the hospital as an acute abdominal emergency, and in coma, because so exsanguinated. Through the relaxed abdominal walls one could feel the blood-clots between the intestines, besides making out the typical shifting dulness in the flanks. The friends gave a history of abdominal tumor of short duration, acute abdominal pain for a week, and sudden collapse on getting out of bed. We were thus able to make a diagnosis of acute abdominal hemorrhage, and that, taken together with the history of long-standing syphilis preceding development of the tumor, which was no longer to be felt when he entered the hospital, made the diagnosis easy. At autopsy, however, we were surprised to find that it was a miliary aneurysm near the origin of the superior mesenteric artery which had burst, so small that it could scarcely have caused a palpable tumor during life, though it could account for his abdominal pain. Whether the tumor said to have been felt by the patient was muscle rigidity, a fecal mass, a dilated loop of small bowel, or only this small aneurysm overlying the abdominal aorta, we cannot at present decide.

To come back to the diagnosis of our present case, I might mention in passing the possibility of a fast-growing round or spindle-celled sarcoma arising from the periosteum or fascia. This might possibly be considered, but it would have to be of extremely rapid growth and, therefore, very rare in this location. It would hardly account for his high temperature and high leukocytosis. Furthermore, there is no increase in the vascularity of the skin, such as we see with sarcoma, and then, too, the patient is below the usual sarcoma age.

Mediastinal abscesses (they are usually tuberculous in origin) sometimes perforate the sternum. But these are fluctuating tumors unless under great tension, are not very tender, and the accompanying fever is the slight afternoon temperature of tuberculous infection. Puncture with an aspirating needle will make the diagnosis before incision even in those cases where fluctuation is absent.

I am using the aspirating needle here in order to play "absolutely safe," since it can do no harm in any event. Have you ever cut down on an aneurysm expecting to find an abscess? I consider myself fortunate in never having done so, but I have seen it done. Consequently, I use a small-caliber hypodermic needle in every abscess or tumor, which by any possibility might be a misdiagnosed aneurysm. (See Dr. Lee's fatal case of supposed supratonsillar abscess reported in the Murphy Clinic.[1])

You see on suction I have secured nothing in this case except a trifle of slightly bloody serum. I stuck my needle right through the swelling down to the bone. The swelling is tense and hard and my needle went through it with marked resistance.

OPERATION

Because of the tense character of the phlegmon I shall make my incision vertically and over the middle of the tumor. I can thus secure the best exposure of the infected area. Hear how my knife grates on this dense tissue. I have cut down to the bone and no pus appears. We have here only a dense, woody, not very vascular inflammatory tissue, a so-called "woody phlegmon," as I judge. I am rather surprised to find it in this location, since we see these woody phlegmons generally in the neck. I consider this a sign of good omen, however. Woody phlegmons usually mean that the infection is due to an organism of low virulence. What we are particularly afraid of in sternal osteomyelitis is that the phlegmon will extend into the mediastinum and cause a fatal suppurative mediastinitis, which is not infrequently the cause of death in these cases. If, however, the organism is rather benign, our drainage, even though done relatively late, as here, that is, on the sixth day, may still save this boy's life. In general, the prognosis in osteomyelitis of the flat bones is, if anything, a little more serious, I should say, than in osteomyelitis of the long bones, because while the danger of pyemia is, perhaps, a little less, the flat bones are situated mostly so close to important viscera that visceral suppurative complications are high in frequency and degree of severity. Henschen[1] states that the ordinary mortality in sternal osteomyelitis is 50 per cent., which, I should say, is not exaggerated.

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[1] Surgical Clinics of John B. Murphy, M. D., vol. iv, No. I, p. 55.

I am now excising the periosteum vertically, and you will see that there is a little cloudy fluid under it, but not much. It separates very easily, you will notice, as in most cases of osteomyelitis. I am sponging off the subjacent bone to see if it "sweats" pus or cloudy serum. Only a few tiny droplets of blood appear. Evidently the pus is not thick or under great tension, as it so often is in the very vascular long bones of children. Now I have chipped away the cortex and we see that some of the marrow cavities show a distinctly cloudy, purulent fluid, though not the thick yellow pus we more frequently see. I am sending a culture of this organism to the laboratory, where I hope it will not get lost. I cannot tell what organism it is, but presume it is a coccus, because the absence of odor shows it is not an anaërobe. Perhaps it is a streptococcus of low virulence rather than a staphylococcus, because pus formation has not been so great as in the average Staphylococcus aureus case.

I am chipping away most of the cortical and medullary bone over the entire area lying directly below the woody phlegmon, clearing out the marrow back to the posterior cortex. Thus I hope to drain the seat of infection so completely that the anterior mediastinum will not become infected unless the infection has already taken place. If it should take place, we can later easily drain it with a few blows of the chisel or bites of the rongeur through the posterior cortical layer of bone remaining, provided we make the diagnosis in time. If his temperature keeps up or increases, together with his leukocytosis, if metastatic foci develop, if cyanosis and dilatation of the vessels of face, neck, and arms develop, we shall then immediately send the patient up to the x-ray room, and if an increased mediastinal shadow is demonstrated, we shall have all the indications necessary for at once establishing mediastinal drainage as above outlined. I am cutting off a little section of this woody phlegmon for microscopic examination.

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[1] Von-Bergmann and von-Bruns, System of Surgery, 1913, vol. II, p. 722.

We now dress this wound wide open, packing rather lightly with iodoform gauze. Our first obligation is to save this patient's life; second, to get a good cosmetic result. If he continues to improve during the next few days, it will be a simple matter to draw the edges of the incision together again, but we must have complete and adequate drainage at the outset.

I have never happened to see an acute osteomyelitis of the sternum before. I have seen several cases of osteomyelitis in the other flat bones, *e. g.*, in the pelvis, especially the ilium, once in the scapula, and once in the spine. Of course, we all see osteomyelitis of the jaw, the ribs, and occasionally the skull.

Drews[1] reported a case of acute sternal osteomyelitis from the surgical clinic in Rostock in 1910, and collected the literature up to that time. He said he was able to find only 13 cases, which would make this condition seem much rarer than it perhaps actually is. Sternal osteomyelitis constitutes nearly $\frac{1}{3}$ of 1 per cent., according to most statistics, of all osteomyelitis lesions. So it must be more frequent than the number of reported cases collected by Drews would seem to indicate. Our patient has had only the body of the sternum involved. This is the usual location, the manubrium and gladiolus being less often involved. There are some cases reported of suppuration of the sternoclavicular joints on one or both sides. Riedinger tells of a case of localized suppuration in the sternum confined to the synchondrosis between the corpus and the manubrium. As a rule these cases perforate more readily posteriorly into the anterior mediastinum than they do forward beneath the skin. When a mediastinal abscess forms, it tends to spread laterally, and may extend as far on either side as the mammillary line, even perforating an intercostal space and appearing beneath or opening through the skin. It causes death by perforation into the pericardium, the pleura, or a blood-vessel.

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[1] Drews, Inaug. Diss., Parchim, 1910.

I have not performed the radical excision here of the entire sternum and costal cartilages which has been recommended for advanced cases where suppuration has embraced the whole bone (Körte). I believe this to be a relatively benign case. The suppuration is local and there are no signs of mediastinal involvement at present. I believe that the patient has a good chance to get well with simple anterior drainage.

Have you ever had a case of progressive infectious necrosis of the costal cartilages following suppuration in their neighborhood? This is, fortunately, a rare lesion, and one surgeon is not likely to have more than a single case, for which he has due reason to be thankful. In spite of excision and more excision and then still more excision, the necrosis goes right on, other cartilages become involved and slough, and death ensues under the picture of profound sepsis. Of course, these are mostly patients of advanced years and less resistance than this young man; but the possibility of progressive costal cartilage necrosis is to be thought of and prophylaxis practised whenever one has a suppurating focus near the ribs in front, for instance, in open rib fractures, typhoid osteitis, osteomyelitis of the ribs, subphrenic abscess, or a liver abscess draining between the ribs anteriorly. This means supporting measures, free drainage, and generous excision at the first appearance of necrosis.

SUBSEQUENT COURSE

The patient ran a fever for several days after the operation. Once it went to 104° F. (rectal) six days after the operation, but no signs of metastatic foci developed and no mediastinal symptoms, so we continued to wait, and day by day the fever dropped and the patient's condition improved. The skin edges were gradually drawn closer together by adhesive strips. Two weeks after the operation his temperature and pulse had become practically normal. His appetite picked up, the wound granulated nicely, and epidermization went on rapidly. He was discharged from the hospital on July 19th, not quite four weeks after the operation. His wound was not quite completely epidermized, but he felt so well that he said he must go back to work. His temperature at that time had been almost normal for two weeks, once going as high as 100.2° F.

So long as the patient's temperature still shows exacerbations, even though only moderate, it is possible that he may develop some pyogenic complication. I dislike to have such a patient leave the hospital, and he did so against my advice, but it is very difficult to exert any adequate control over some of our foreign population.

February 4, 1918: The patient, on request, returned for re-examination. He states that he has felt well since leaving the hospital and has been at work. A postero-anterior roentgenogram showed no particular change, the mediastinal shadow was normal, and there was no very noticeable hyperostosis of the sternum.

SPONTANEOUS RUPTURE OF VENTRAL HERNIA IN OLD SCAR WITH PROTRUSION OF SMALL BOWEL

Summary: Presentation of patient and operation—closure of abdomen without drainage; remarks on spontaneous ruptures of the abdominal wall.

HISTORY

The patient, a German woman sixty-one years old, entered Cook County Hospital July 17, 1916, with a loop of the small bowel, 12 or 15 inches in length, lying free on the skin of the abdomen. The bowel had a few strips of gauze covering it which had been placed there by the family physician. The patient's previous history is as follows:

She was operated on at a private hospital in Chicago two years previously, that is, in 1914, for some abdominal condition. The nature of this condition and the details of the operation performed she does not know.

She made an uneventful recovery from this operation and had no subsequent trouble until today (July 17, 1916). About 4 o'clock in the afternoon, while she was going about her house-work, she suddenly felt a sharp pain in her lower abdomen and then something warm and soft on the skin. She loosened her clothes and saw the protruding bowel. She was greatly alarmed and sent at once for her family doctor, who had her promptly transferred to the County Hospital. The patient's abdominal pain has continued since the rupture occurred, and she complains that this pain runs all the way from the pubes to the lower sternum.

Otherwise the patient has been perfectly well lately. The only illness which she remembers before her operation two years ago was an attack of typhoid fever about thirty years previously. She has had "grip" occasionally. She has never been pregnant, and knows no reason why her abdominal wall should be so extremely weak unless it be due to the previous operation.

OPERATION

Since the case is urgent, I have not stopped to make a physical examination except to assure myself that there is no cardiac lesion present to contraindicate a general anesthetic. I had her sent immediately up here to the operating floor.

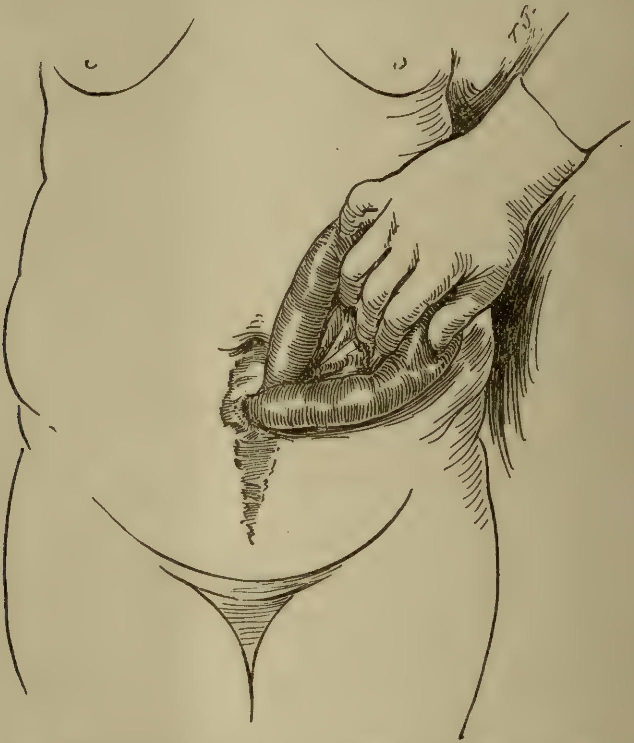

Fig. 89.—Spontaneous rupture of ventral hernia in old scar, with protrusion of small bowel. Note the relatively large amount of bowel which has slipped out through the small tear in the center of the scar. Until drawn aside by the hand the bowel completely covered the hole, which barely admitted a finger-tip alongside the bowel.

We are holding the extruded bowel in moist sterile wrappings away from the skin and are cleaning the abdominal wall with alcohol. As we lift the bowels from the surface of the abdomen, the rupture opening can be seen, and it is astonishingly small for so large an eventration of bowel (Fig. 89). It is, I should say, $\frac{3}{8}$ or possibly $\frac{1}{2}$ inch in length, certainly no more, and barely admits a finger alongside the bowel. The extruded bowel is dilated, dusky in color, but not black. The tear is slightly diagonal from right above to left below, a little above the midpoint between the navel and the symphysis, practically in the midline. We are cleansing the bowel by swabbing it off with sponges wrung out of normal salt solution. We shall not waste much time doing this, however, because there is no gross dirt on the bowel.

Now the abdominal wall is prepared and I wrap the bowel in a moist sterile towel while I enlarge the opening transversely from side to side, in order to be able to replace the bowel and examine the adjacent peritoneal surfaces. Now the bowel is returned to the abdominal cavity. I am excising the scar tissue in the abdominal wall so far as I can and still permit closure of the wound. I am trying to overlap the layers of the abdominal wall as much as I can. The amount of scar tissue present does not permit the imbrication to be as typical or as extensive as I should like. I am closing the skin with silkworm-gut and Michel clips *without* drainage. The peritoneum usually overcomes the slight infection present in such cases very easily.

COMMENTS

These spontaneous ruptures of the abdominal wall are, fortunately, not very common. This is the second case I have seen, and I know of about 40 cases from the literature. Some of them are very curious. Maetzke (Deut. med. Wochenschrift for 1910, No. 18, p. 843), for instance, tells of a patient not unlike ours. This patient was a woman who had been twice delivered by cesarean section. After the second operation a hernia developed in that part of the wound which had not healed primarily. Two years later, while the woman was working in the field, this old scar broke open. About 70 cm. of the small bowel protruded. Although reposition by operation was not attempted until the next day, the wound healed without complication except for a small stitch abscess. Following the operation, however, the patient took no better care of herself than previously and could not be induced to wear an abdominal bandage. Consequently there was a large recurrence of the hernia into the scar. Maetzke reports that the last time he observed the patient the skin had already become so thin over the herniated bowel that he expected a new eventration to occur at almost any time.

I ran across reports of 2 cases where just such a second rupture took place, and an operation had to be performed for the second time to repair the eventration. Both patients survived the second operation!

Loennberg (Nord. Med. Arkiv., 1911, Festschrift für J. Berg) reports a case like mine. A woman, aged fifty, was operated in 1903 for an abscess in the right iliac fossa. The wound healed by granulation. Four years later, in 1907, the patient first noticed that there was some bulging in the scar. Two years later, on March 1, 1909, the patient lifted a heavy washtub, and in straining to do so the thin skin over the hernia ruptured and a loop of bowel slipped out. Three hours later, when the patient was operated on, about 25 cm. of small bowel had prolapsed through the opening, which was so small that one finger could barely be passed into it. The rupture opening was enlarged; the loop of bowel was washed off and replaced. The *wound was tamponed for twelve days* and then a radical operation for hernia was performed. Loennberg cites 2 similar cases from the Scandinavian literature. He thinks that his method of first tamponing and then performing the radical hernia closure at a second operation is better than the performance in one step. In all three cases collected by Loennberg the rupture took place through the hernial scar just as in the 2 cases I have to report.

Rabinova (Prager med. Wochen., 1909, No. 22) reports a rupture of an abdominal laparotomy scar following an operation for tuberculous peritonitis, and thinks that the development of tuberculosis in the scar as a result of the implantation at the preceding operation was the cause of the eventration. The rupture in his patient took place exactly two months after her operation.

Levy and Roques (Gaz. des hôpitaux, 1910, No. 117) report a rupture of an inguinal hernial scar with prolapse of the intestine as a result of spontaneous ulceration of the skin. The patient, a man nearly seventy, was operated on for incarcerated inguinal hernia. The wound suppurated, but finally healed. The patient was discharged still wearing a bandage. Two years later the patient suffered a relapse, and for this he wore a small truss. Finally, the skin became superficially ulcerated, and then one day 40 cm. of small bowel suddenly protruded. At operation it was found that under the skin a pocket had been formed in which there was 40 cm. more of bowel, the lower 8 or 10 cm. of which was firmly adherent to the under surface of the skin. A radical herniotomy was performed without any resection of the bowel; the raw areas were covered in the best manner possible under the circumstances. Recovery is said to have been uneventful except for a fecal fistula of short duration. In separating the bowel from the skin the bowel was accidentally nicked and the cut sewed up. The fistula is supposed to have arisen from this site.

There are a number of articles on subcutaneous rupture of the abdominal wall with prolapse of the viscera beneath the skin, notably those of Von Saar, Esau, Von Howell, Prieur and Wetzel, Fodereal, Hopp, Stern, and others. There are also a number of reported instances of protrusion of the bowel through the umbilical scar in newborn infants.

At any rate, so far as I can find, this spontaneous rupture of abdominal scars seems to be a relatively rare occurrence. Perhaps it should be considered surprising that more cases do not occur, in view of the large number of laparotomy scars which we see, where through improper suture of the original wound, or subsequent suppuration or carelessness and neglect on the part of the patient, the abdominal coverings have thinned out until only the skin lies above the viscera. In some cases the skin becomes so thinned that the intestines cannot only be felt but also actually seen through it, and yet it holds.

Nature, as a rule, seems to be kind to these patients. The peritoneum is tolerant and the accident usually happens when the patient is enjoying good general health. Hence the astonishingly high percentage of recoveries. The moral to be drawn from these cases is that bulging hernial or laparotomy scars contain some element of danger as well as of inconvenience to the patient. Better reoperate in time, excise the scar, and make a new and stout wall by suitable plastic repair.

SUBSEQUENT COURSE IN PRESENT CASE

The patient was put in the Fowler position and given tap-water per rectum à la Murphy. She ran some fever for nearly ten days following the operation. At one time her temperature was as high as 102° F. It was, I suppose, due to a low grade of peritonitis. The fever gradually came down and the wound healed uneventfully. She continued, however, to have some abdominal pain from time to time and an occasional flare-up of temperature to 100° or even 100.5° F. Little by little, however, the flare-ups became less frequent and the pain gradually subsided. No abscess could be felt in Douglas' pouch at any time. The patient's bowels moved daily, sometimes requiring the aid of a cathartic. At the end of two months she was discharged, free from pain. Her temperature had then been normal, that is, not above 99° F., for two weeks.

CLINIC OF DR. HERMAN L. KRETSCHMER

Alexian Brothers Hospital

CARCINOMA OF THE PENIS

Summary: A patient with huge, ulcerating metastases in each groin, secondary to a carcinoma of the penis which had been removed two years previously; age incidence, etiology, lymphatic involvement, diagnosis, and treatment of carcinoma of the penis.

DEMONSTRATION OF A CASE OF CARCINOMA OF THE GROIN

Case I.—Mr. W. W. was admitted to my service in the Alexian Brothers Hospital November 2, 1916. He is thirty-four years of age, married, by occupation a clerk.

Two and one-half years ago he was operated upon for carcinoma of the penis, for which an amputation was performed, and the urethra transplanted into the perineum. The patient states that he has enjoyed good health for the past two years.

About three or four months ago he noticed an enlargement in the inguinal glands. He states that they were hard and did not give him any pain. Two months ago the glands on the left side broke down and began to discharge; this resulted in the production of an ulcer which has been gradually enlarging ever since. On the right side the glands are also swollen and tender.

Examination.—General examination is negative. Examination of the abdomen is negative. Examination of the inguinal region shows that the glands on the left side are enlarged. The skin covering these glands is ulcerated and cyanotic. There are several areas of suppuration each about the size of a silver dollar. On the right side the glands are as big as the hand, and on the left side as big as a hen's egg. Penis is absent. Examination of the scrotum shows the urethra in the perineum just behind the scrotum. The testes are negative and rectal examination is negative. Blood examination shows 3,208,000 erythrocytes, 17,000 leukocytes, and 60 per cent. hemoglobin.

After admission to the hospital the question of surgical removal of these enlarged glands was considered. Owing to their extensive size and because of the fact that they were bound down to the deep structures of the groin and extended into the pelvis, operative removal was not considered advisable. The patient was given radium treatment, but without avail. The glands began to break down rather rapidly and began to grow in two directions—up on to the abdominal wall and down into the groin and pelvis. Examination made on January 1st showed in the left inguinal region the presence of a large, oval ulceration 4 inches in diameter. The tissue of this ulcerated area is irregular, nodular, and covered with grayish sloughs. The edges are elevated and firm in consistency. Several small nodules in the margin are broken down and form the seat of small, apparently secondary ulcerations beyond the margin. The lesion has a rather foul discharge.

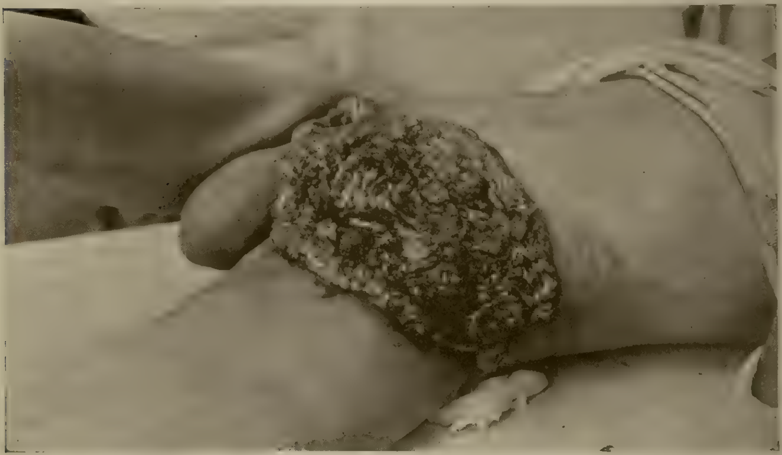

Fig. 90.—Showing extensive carcinoma of the inguinal glands. Note absence of penis and recurrence in glands of the opposite groin.

On January 1st the patient had a slight hemorrhage from this mass of glands. This mass of carcinomatous glands has continued to enlarge, so that today it extends well on to the abdomen and down the thigh. By actual measurement it is 9½ inches in its longest diameter and 6 inches in its shortest diameter (Figs. 90, 91). The microscopic examination made on the tissue removed shows the presence of an epithelioma with pearl formation. While the left side has been growing so rapidly, the right side has also advanced and formed a large ulceration, but it has not extended as far up or down as the mass on the left side. Just beyond the margin of this tumor may be seen several small nodules of carcinoma. These usually grow to the size of a hazelnut, then break down and ulcerate, and then join the main tumor mass. The patient's left thigh shows the effect of the lymph stasis, so that a lymphedema of the entire

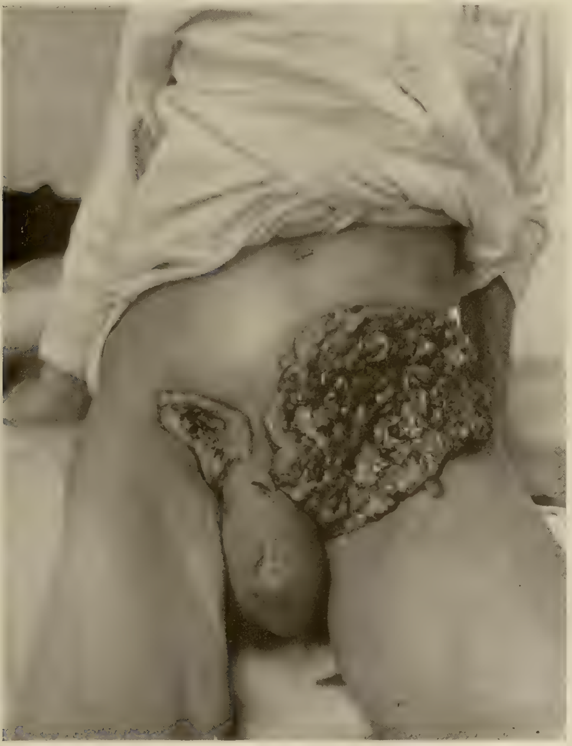

Fig. 91.—Frontal view of Fig. 90.

extremity has now developed. The left thigh is about one-third larger than the right one. Examination of the heart and lungs is negative. A roentgenogram of the chest fails to show signs of carcinomatous metastases in the lungs. The liver is negative.

There are several interesting things about this patient. First, his age. He was only thirty-two at the time that the penis was removed by amputation. According to Kaufman, Küttner, and others, 75 per cent. of cases of carcinoma of the penis occur in the fifth, sixth, and seventh decades. These figures have been verified by Jahn, who, in a statistical study of 1161 cases reported in the literature, found approximately 75 per cent. occurring in the decades just mentioned. Cases occurring in very young individuals are also reported in the literature, but they are very rare. The youngest case is probably that of Creite, whose patient was a boy of two years. Fielewicz reported a case in which the tumor grew very slowly in a man of twenty-six. In Ralph's case the patient was twenty-two. Cases in patients under thirty have been reported by Küttner, Kroenlein, Jahn, and others.

At the time of his operation the inguinal glands were not removed, for what reason I have not been able to ascertain. It would seem that had the glands been removed, this recurrence might have been delayed or perhaps entirely prevented. The operation itself has been a very good one, as there are no signs of local recurrence.

ETIOLOGY

Nothing definite is known regarding the etiology of carcinoma of the penis any more than is known about the etiology of cancer in other parts of the body. Among the predisposing factors one seems to deserve mention, and that is the presence of congenital phimosis, to which fact many surgeons interested in this topic have called attention. In a statistical study based on 664 cases congenital phimosis was present in about 45 per cent. of the cases (Jahn). It would seem that phimosis may be a predisposing factor. Some authors maintain that this disease does not occur in Jews. That persons who have been circumcised may develop carcinoma is known. Prof. Djeniel Pacha operated 5 carcinomas in four years. He is connected with the Military School at Constantinople which admits only Musselmen.

Although attention has frequently been called to the possibility of contact infection during sexual congress, and isolated cases are recorded in which the wife suffered from carcinoma of the uterus, and later the husband developed carcinoma of the penis, the facts do not warrant the assumption that this mode of transmission is at all a likely one, for carcinoma of the uterus is of much more frequent occurrence than is carcinoma of the penis.

Psoriasis or leukoplakia preputialis has been described as a result of chronic irritation due to phimosis, and it is believed that this favors the development of carcinoma, and according to von Winiwarter two-thirds of all cases of carcinoma of the penis suffer with phimosis.

Carcinomata have developed not only in syphilitic ulcers but also in the scars resulting from venereal sores.

Lymphatic Involvement.—A peculiar characteristic of carcinoma of the penis is the relatively frequent or relatively early involvement of the lymph-glands, especially both inguinal glands. Occasionally the first glands to be involved are the retroperitoneal glands, some of which, according to Küttner, are in direct communication with the lymphatics of the penis. Occasionally the lymph-glands are apparently free in an extensive carcinoma, and at other times the amount of lymph-gland involvement is very extensive, while the tumor itself may be very small.

DIAGNOSIS

The diagnosis is usually relatively easy. In doubtful cases a piece may be removed under local anesthesia for microscopic examination. Just as soon as the diagnosis is made treatment should be instituted, and the treatment should be radical. Temporizing measures, such as sterilization or excision of the growth, are all followed by prompt recurrence. Diagnosis of carcinoma of the penis is synonymous with amputation of the penis. The more radical the operation, the better the end-results. Our patient is now having severe hemorrhages and he is losing rapidly in weight and strength. Death in these cases of recurrence is usually due to one of two things, either hemorrhage or sepsis.

Case II.—The second patient that I should like to present who is suffering from a carcinoma of the penis is Mr. J. R., aged sixty-nine, married, by occupation a clerk. There is nothing in the family history of any moment as bearing on the patient's present illness.

Previous History.—Measles, typhoid, and pneumonia. When twenty years of age the patient had a chancre, but he does not remember the exact location of it. It is interesting to note this fact from the standpoint of the possibility of his carcinoma being ingrafted on the scar of the chancre, as mentioned previously when I considered the etiology.

Present Complaint.—The patient states that the present trouble began about six months ago with the appearance of a small hard lump in the foreskin. This, he states, has gradually increased in size. He says that this nodule was painful as soon as he noticed its presence. The patient furthermore states that there has been present a dirty brownish discharge, appearing soon after he noticed the onset of his present trouble. The patient also complains of difficulty in passing his urine, which doubtless is due in part at least to the fact that the foreskin cannot be retracted. The swelling and induration of the foreskin began about five months ago and have increased since that time.

Physical Examination.—The patient is a white male, apparently sixty-nine years of age, weighing 140 pounds, and well preserved for his age. There are no gross deformities. Head, neck, eyes, ears, nose, and mouth are negative. The neck is negative and there is no evidence of enlarged cervical lymph-nodes. The lungs show the presence of a few moist râles in both apices. There are no areas of dulness. The heart is negative. The abdomen is negative. There are no areas of tenderness and the liver is not enlarged.

Inguinal glands: The inguinal glands on the right and left sides are enlarged and can be palpated very easily. The glands on the left side are tender to palpation.

Penis: The skin is very cyanotic. The foreskin is long and cannot be retracted. There is a swelling under the foreskin which is very hard, and seems to extend from the external urethral orifice back to the sulcus. The scrotum is negative. The epididymi on both sides are hard and enlarged.

Rectal examination is negative.

Extremities: Negative.

The discharge from the penis was examined and showed the presence of pus, but no gonococci.

Urine analysis showed the following: Cloudy; acid; albumin positive and sugar negative. Microscopic examination showed the presence of much pus. Cultures of the urine showed the presence of staphylococci.

Blood count: Erythrocytes, 4,960,000; leukocytes, 6000; hemoglobin, 95 per cent.

Because of the fact that one could not retract the foreskin it was decided to do a dorsal slit under local anesthesia. This was done three days ago. This showed the presence of an ulcerating carcinoma the size of a peach stone. The carcinoma extended from the external urethral orifice back through the corona glandis. The carcinoma extended into and involved the glans penis, so that the left half of the glans has been replaced by carcinoma. The carcinoma extended on to the inner leaf of the foreskin.

Microscopic examination of the small piece which was excised under local anesthesia verified the clinical diagnosis of epithelioma.

The diagnosis, therefore, having been definitely made of a carcinoma with involvement of the lymph-glands, it was decided to do a radical extirpation. We will do this operation this morning. We will try and remove the entire organ and the lymph-glands in one mass, thereby avoiding opening up the lymph-channels. From our examination of the patient it is perfectly clear that nothing short of a radical operation can hope to give him any relief. The case previously demonstrated shows the value of removing the lymph-glands as a routine, which procedure we always do whether the glands can be palpated or not.

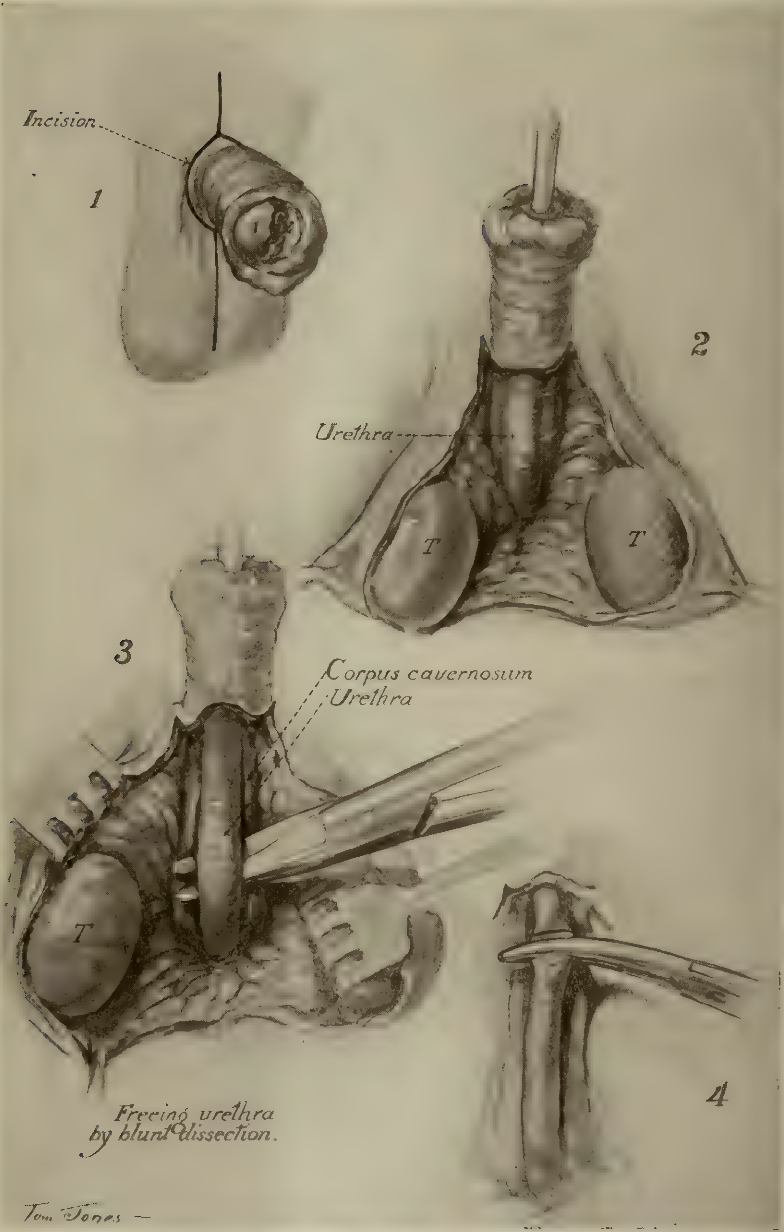
Incision
1
2
Urethra
T
T
3
Corpus cavernosum
Urethra
T
Freeing urethra by blunt dissection.
4
Tom Jones

Fig. 92.

Operation.—The patient is placed in the lithotomy position. A steel sound is now inserted into the urethra. We will begin our incision from the symphysis pubis, passing downward to the root of the penis. We will carry this incision to each side of the penis so as to encircle it. The two lines of the incision will meet in the median line below the penis, from which point the incision will be carried down in the median raphé to the perineum (Fig. 92, 1). We will now bisect the scrotum, and by a blunt dissection separate both testes without opening the tunica vaginalis (Fig. 92, 2). We are now carrying this dissection down to the corpus spongiosum by means of a sponge dissection. The corpus spongiosum with the sound can easily be seen and felt as it is dissected free from its attachment to the corpora cavernosi. We will continue this dissection, so that we may free the urethra as far back as the anterior leaf of the triangular ligament. At this point we will remove the sound, and the urethra, having previously been clamped by an artery forceps, will now be cut across (Fig. 92, 3, 4). We will now carry the incision around the root of the penis down to its fibrous sheath, and we will divide the suspensory ligament at this point. Both corpora are freed by blunt dissection as far back as the crura. The cavernous tissues are divided, having first clamped the crura with heavy artery forceps. A ligature is placed around the crura in order to ligate the artery at this point (Fig. 93, 5). The crura are now dissected upward and freed (Fig. 93, 6). The dorsal artery and vein which now come into view are ligated.

The crura and distal part of the urethra have been removed in one mass, and will be allowed to lie for the time being upon the side. The urethra, which has been divided, will be split and attached to the lower angle of the wound by two or three catgut

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Fig. 92.—1. Showing the first incision, which begins above the root of the penis, is carried down to the penis, which it encircles, and the two encircling incisions meet in the median line, from which point they are carried on the median line of the scrotum to the perineum. On the left side the edge of the carcinoma can be seen. 2. The scrotum has been bisected. The tunica vaginalis has not been opened. The urethra, with a sound in place, and the corpora cavernosi are easily outlined. 3. Freeing the urethra by scissors dissection from the corpora cavernosi. 4. A clamp is placed on the urethra prior to cutting it.

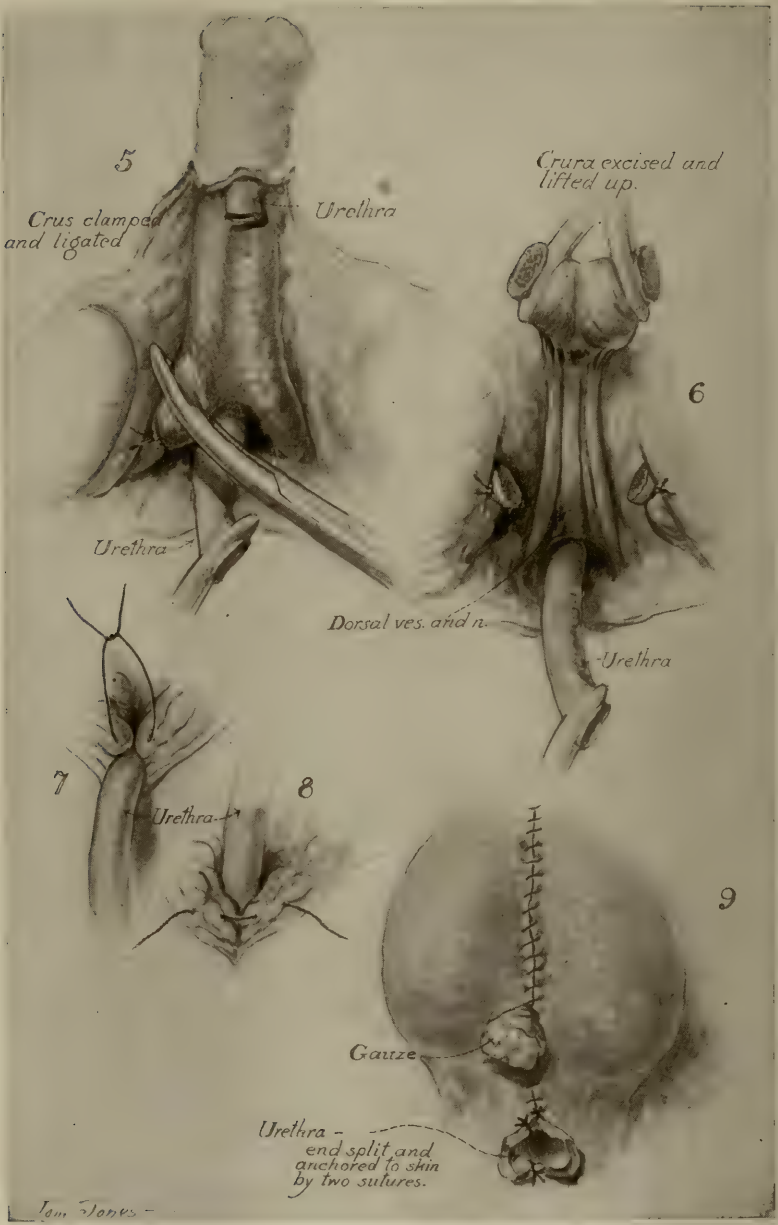

5
Crus clamped and ligated
Urethra
Urethra
Crura excised and lifted up.
6
Dorsal ves. and n.
Urethra
7
8
Urethra
9
Gauze
Urethra - end split and anchored to skin by two sutures.
Tom Jones

Fig. 93.

sutures. The cavity is now packed lightly with iodoform gauze and the usual closure will be made (Fig. 93, 7–9).

Now we will change the patient's position. He will be taken out of the lithotomy position and placed flat on his back. An incision is now made parallel with Poupart's ligament beginning at our original incision and extending outward and upward to the anterior superior spine of the ilium. By blunt dissection the inguinal glands and fat are removed in one mass (Fig. 94, 10). As previously stated, our object is to remove the glands on both sides of the penis in one mass, so that the lymph-vessels are not opened. This we have succeeded in doing very well on the left side. On the right side, however, as the dissection proceeds the glands are detached from the large mass, so that these glands will have to be removed separately. Now this dissection is completed and the penis and lymph-glands are removed in one mass. The dissection has been carried down to the external oblique, and at this point you will see the cord where it leaves the external ring. These two cavities, the right and left inguinal canals, will be packed with iodoform gauze. The deep layers will be closed with catgut and the skin with silk (Fig. 94, 11). A soft-rubber catheter is now inserted into the urethra and is stitched to the skin. This catheter we will allow to remain for three or four days, at the end of which time it can be removed, and the patient then proceeds to spontaneous urination.

We believe that if these patients are subjected to operation for their cure and a radical operation is done, the end-results are very good. I recently saw two patients who were operated upon elsewhere and on whom this procedure was carried out. Both are still alive after eighteen years. In both instances a diagnosis of carcinoma based on histologic examination had been made.

Fig. 93.—5. The urethra has been severed, showing the corpora cavernosi and the urethral groove. A ligature has been placed around the crus close to its insertion. 6. The corpora have been freed and are lifted up. Both crura have been ligated. The dorsal vessels and nerve are seen. 7, 8. Fixation of the urethra into the lower angle of the wound. 9. The urethra has been split and fixed to the skin by two catgut sutures prior to the introduction of a permanent catheter.

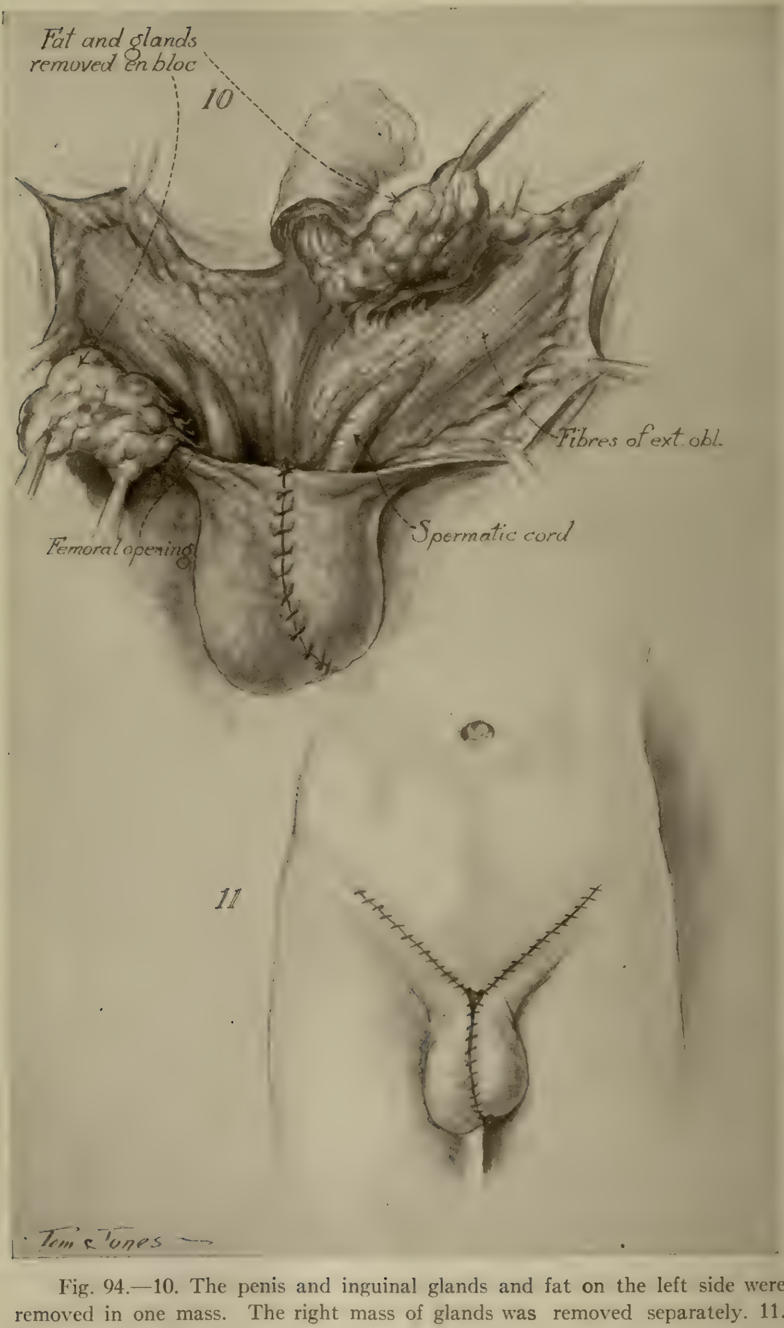


Fig. 94.—10. The penis and inguinal glands and fat on the left side were removed in one mass. The right mass of glands was removed separately. 11. Closure.

CLINIC OF DR. V. D. LESPINASSE

WESLEY MEMORIAL HOSPITAL

IMPOTENCY: ITS TREATMENT BY TRANSPLANTATION OF TESTICLE

Summary: Causes of impotency—castration, psychic changes, disease of the spinal cord, testicular hypoplasia, hormone deficiency; the etiologic diagnosis; the treatment; technic of transplantation of testicle by morcellation; results.

WHILE potency is not essential to life, potency is very essential to the happiness of most individuals. Physicians should not only try to save life, but also attempt to correct deformities and conditions that interfere with full enjoyment of life. Hence anyone who develops means or methods of relieving impotency will increase the sum of human happiness very much.

The study of impotency must embrace a study of the whole domain of medicine in order to enable one to make an etiologic diagnosis and subsequently to carry out the treatments directed to the structures definitely at fault.

CAUSES OF IMPOTENCY

1. Loss of testicles:
    - (*a*) By accident.
    - (*b*) By disease.
2. Psychic changes.
3. Structural changes in central nervous system, particularly injuries and diseases of the spinal cord.
4. Hypoplasia of the testicle:
    - (*a*) Congenital.
    - (*b*) Acquired (internal secretion cases).

DIAGNOSIS

The accident cases are easily diagnosed from the history of a scrotal trauma. The examination shows absence of the testes and various scars on the scrotum. Likewise, the destruction of the testicles by disease is readily determined by the history, and physical examination shows the testicles more or less atrophied, depending upon the severity of the disease. Usually they appear as small, soft masses at the end of the cord, varying in size, depending on the amount of atrophy. The epididymis may or may not be present and may or may not be normal if present.

Psychic Types.—In the psychic types of cases we make the diagnosis not from any one point, but from a complete history and examination. The patients are usually young adults between twenty and thirty years of age. They give a history of normal sexual abilities up to a certain time, and since that time their powers have been deficient. Their disability dates from some specific occurrence, at which time they failed to have complete satisfactory intercourse. This fact startles them and starts them to thinking about their sexual powers, and they become markedly introspective and begin wondering if they are really losing their sexual ability. At the next attempt they are fearful of failure, and failure occurs, which fact causes more perturbation, and on any subsequent attempt at intercourse failure occurs. The circle is kept up, and soon they present a well-marked case of psychic impotency. A physical examination of these patients shows that they are organically sound, but they are usually of the so-called nervous temperament. The treatment is directed to breaking this vicious circle, best by psychic means, either by psycho-analysis or by using some infusive drug or other method that will make a profound impression on the patient, such as a dye to color the urine red or a very bad tasting mixture, with the advice that its therapeutic strength is in direct proportion to its nauseating properties.

The *structural type* of case is one in which there is a definite organic lesion of the nerves and is due to sections of the spinal cord, tumors of the spinal cord, and tabes. According to Church, 58¼ per cent. of tabetics have a diminished or complete loss of sexual powers. The treatment of impotency due to these conditions is the treatment of the basic causal condition, whatever it may be—surgery for the cord tumor cases and intensive intravenous and intraspinal salvarsan treatment for the tabetic.

Hypoplasia (*Congenital*).—I have never observed a case of hypoplasia of the interstitial elements of the testicles with preservation of the spermatogenic tubules, although Cushing pictures such a case with normal development of the spermatogenic tubules and with practically no interstitial cells of Leydig. The boy had never acquired complete secondary sexual characteristics. Hypoplasia of the spermatogenic elements of the testicle, with preservation of the interstitial tissues and large numbers of cells of Leydig, is a relatively common condition. These patients are not impotent at all, but perfectly normal as regards sexual abilities, although they are sterile and usually come under observation for that condition. Patients who show a complete absence both of the spermatogenic elements and the cells of Leydig are relatively common. The testicle in these individuals is just a little mass of connective tissue. In this connection it is interesting to quote a case of Cushing's, in which there was a marked excess of the interstitial tissue and large numbers of the interstitial cells of Leydig. The seminiferous tubes were of the preadolescent type. The individual showed marked precocity as regards secondary sexual characteristics.

These conditions are easily accounted for if we bear in mind the embryology of the testicle. The indifferent sex glands of the embryo are composed of two distinct structures, the superficial epithelium and the stroma. The superficial epithelium forms the interstitial cells of Leydig—the cells which are responsible for the internal secretion of the testicle. The stroma forms the spermatogenic tubules of the rete testis. The Leydig cells are quite abundant up to about the fifth month of pregnancy, then they begin to disappear, and about the seventh month there is only an occasional Leydig cell present. At puberty the Leydig cells reappear in considerable numbers. Clinically these congenital hypoplasia cases are diagnosed by the persistence of childish characteristics and by the absence of the secondary sexual characteristics of the male or the development of certain female characteristics, such as breasts, feminine distribution of hair, adiposity, and fine texture of the skin.

In my experience the largest group of impotency cases is the internal secretion group, as I have called them. These are men from thirty-five to sixty years of age, usually of good physical development, who have been active in business and social life. They may or may not have had some venereal disease, but if they have, it is, as a rule, of no consequence in relation to their present condition. They simply come for relief from the gradual failing of their sexual powers. The history shows that their failure has been gradual; that in their early twenties they were either normal or, as many of them think, they were abnormally potent. They indulged excessively in intercourse, and now, at about forty, they find that intercourse is possible but seldom, if at all.

A general physical examination is usually negative. The examination of the genitalia shows a penis whose skin is flabby and whose glans is usually wrinkled and inclined to be cold. The testes are slightly smaller than normal and are quite soft, giving the impression that they had been larger and had shrunken in the tunica albugenia. Urethroscopically, as a rule, they are negative as to any condition that has any influence upon their potency. When examined as to the glands of internal secretion many of them will show some slight symptoms of deficient action of the pituitary or adrenal other than impotency. Their sugar tolerance may be a little bit high and the pulse a little slow. There may be a little excessive development in the breasts, adiposity, and a slight deficiency in the beard. The blood-pressure is low. They may have any one or all of these changes. It is surprising how many of these cases will fit in in a small way with the symptomatology of a well-developed case of pituitary disease. One of my cases, upon whom I diagnosed pituitary impotence seven years ago, has since developed well-marked pituitary disease, for which he has been operated on.

TREATMENT

If we remove all toxic elements from these patients, such as smoking and drinking, and regulate their diet and exercise, we will obtain betterment up to a certain point, but usually this improvement is far short of real relief. Feeding with the deficient gland may be effective. If the deficient gland is in doubt, give the patient the benefit of the doubt and administer a shot-gun prescription composed of anterior lobe of the pituitary, adrenal cortex, and interstitial cells of the testicle mixed in one capsule. With these feedings many cases will be relieved, but where they fail we should do a homotransplantation of the testicle. To my mind the disabilities of these individuals is due either to a lack of the internal secretion of the testicle produced by the Leydig cells alone or the symptoms are produced by a lack of the internal secretion of the testicle, anterior lobe of the pituitary, and adrenal cortex in combination.

The case we have to operate on today is one of these cases of acquired absence or deficiency in the secretion of the Leydig cells. We have determined to transplant a normal testicle into him.

The patient is a man about fifty-five years of age. He is in perfect health and vigor in every way but sexually. He has noticed a gradual diminution of his sexual abilities for the last ten years, so that at the present time he is absolutely impotent. He has normal sexual desire, but erections do not occur at all.

Examination.—The heart, lungs, face, and neck are negative. Blood-pressure is 140, pulse 71. Arteries are soft. Abdomen is negative. The penis is small and its skin is in folds. Mucosa of the glans penis is wrinkled. The testicles are about one-half the normal size, soft, and flabby. Prostate and seminal vesicles are normal. Urethroscopic and cystoscopic examinations have not been made.

Sugar tolerance: 150 grams of glucose were given by mouth. At hourly intervals thereafter the bladder was emptied and the urine tested with Fehling's solution, with the following results:

Slight reduction in one hour.
More in two hours.
Good sugar in three hours.
Good sugar in four hours.
Slight in five hours.
None in six hours.

Technic of Operation.—The technics that have been used in the transplantation of testicles are:

1. Blood-vessel anastomosis, of which there are two types: the direct end-to-end union of the spermatic artery and veins, and the so-called Patching operation, neither of which are of any particular value.

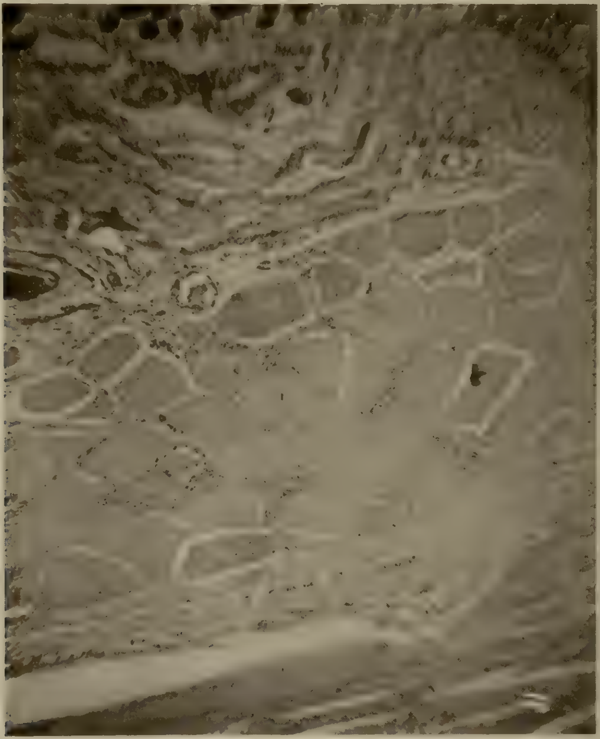


Fig. 95.—Low power of a transplanted testicle (dog) two months after operation. Note the complete absence of nuclei in the spermatogenic tubules. Note also the increase of the interstitial tissue between the tubules.

2. Transplantation *en masse*—of doubtful value.

3. Transplantation by morcellation—the method which we shall follow.

We make an incision through the skin and fat down to the rectus muscle, separate the fibers of the rectus muscle with an artery forceps, and examine the space so made to be sure there is no hemorrhage. This constitutes the bed into which the pieces of testicle will be carried. Now we make a similar incision on the opposite side of the midline and prepare our bed in the rectus muscle in the same way. Next we cut the testicle into slices about 1 to 2 mm. thick, denuding them of tunica albuginea. These slices are placed into the bed previously prepared in the rectus muscle, the sheath of the muscle sewed with catgut, the skin sutured with silkworm-gut, and a collodion dressing applied.

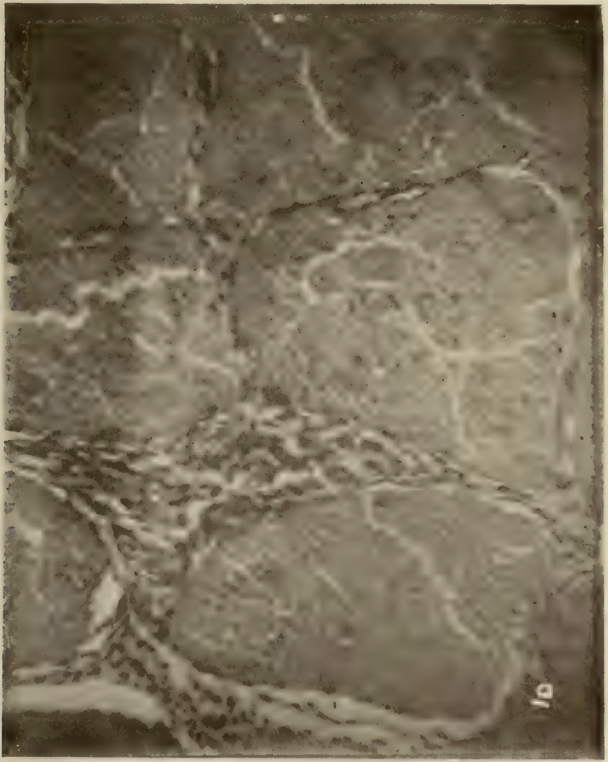


Fig. 96.—High-power field from section shown in Fig. 95. A junction point of several spermatic tubules. Note the absence of the nuclei and cells from the spermatic tubules; also note the large nest of well-preserved Leydig cells in the pictures.

We may expect results to become manifest in a few weeks. In some instances these may be permanent, but in many cases we must be prepared to find our transplants completely absorbed in the course of a few months with, of course, coincident effacement of any benefits which may have accrued to the patient. It is of interest, in this connection, that the Leydig cells are much more virile than the spermatogenetic elements, and in experimental amounts retain their staining properties for days after definite necrosis of the tubule cells of transplanted testicles has occurred (Figs. 95, 96).

It is not always an easy problem to obtain material for transplantation into these patients. The ideal testicle for transplantation would be that obtained from a vigorous, healthy man which could be implanted in its new location without delay, and which previous serologic tests had shown would not be incompatible with the patient's tissues or body fluids. Such material, for obvious reasons, is beyond the reach of surgeons in the great majority of instances. We are forced to rely for material on the occasional case of accidental death or suicide in which we can rule out syphilis and from which the testicles can be removed aseptically as soon after death as possible. Apparently successful transplantations have been done with material which had remained in the unrefrigerated body for from seven to twelve hours. We prefer, however, to obtain the material without unavoidable delay. Immersed in physiologic salt or Ringer's solution tissues freshly removed from a body recently dead may be preserved in the ice-chest for twenty-four hours before transplantation, although even that short interval is undesirable and may be fatal to the results.

CLINIC OF DR. JOHN L. PORTER

St. Luke's Hospital

TENDOPLASTY FOR PARALYTIC TALIPES VALGUS

Summary: Mechanism of the development of deformity following infantile paralysis; substitution of active for paralyzed muscles; technic of transference of tendon of peroneus longus to insertion of tibialis posticus—insertion of suture into tendon—utilization of sheath of paralyzed tendon—subperiosteal suture of transplanted tendon; arthrodesis on astragaloscaphoid joint; after-treatment—plaster cast and prolonged protection from overstrain.

October 6, 1917.

We have today a very interesting case of infantile paralysis illustrating two different types of deformity following the paralysis.

This youngster is ten years old. Three years ago he had an attack of poliomyelitis anterior, and as a result he has two different types of paralysis in the two legs.

I ask him to hold the right leg up straight, and he says he cannot. I also ask him to lift it up and put it on the table, and again he says he cannot. You see the flexion of the thigh when he is sitting depends on the function of the iliacus and psoas muscles. The extension of the leg depends upon the contraction of the quadriceps extensor. He cannot hold up his leg. He has lost the power of his quadriceps extensor. He can pull his foot up, but he cannot push the foot down just because he has lost the calf group in this right leg, and the tendo achillis is very weak, although not completely paralyzed. The heel has a tendency to drop down so (indicating) when he walks, so that he has a very awkward gait because he is unable to lift his weight over his toes. When you carry your weight forward you use the calf muscles to lift the weight over the foot. This leg, therefore, presents a paralysis of the iliacus, psoas, and quadriceps extensor muscles in the thigh and the soleus and gastrocnemius in the leg. They are the so-called extensors of the foot.

Now we will examine the left leg. I ask him to put this foot up on the table He has his iliacus and psoas in that leg because he can lift the thigh on the abdomen when he is sitting. He has the quadriceps extensor because he can hold the leg extended. When the foot is lifted in extension it turns out in a condition of pronation. When the foot comes up extended it comes up pronated, showing that the peroneal group—the peroneus longus and brevis—are active, while the tibialis anticus and posticus are not. These muscles are internal extensors which pull the foot up supinated, and when they become paralyzed marked disability and deformity is always produced. This boy cannot walk flat on his foot. Any foot that is pronated is a disabled foot. Supination is the normal walking position. In order to give him a good walking gait and a good useful leg both legs have to be taken care of, but we propose to begin with the left and to transplant the peroneus longus to the inside of the leg and give him a foot which can be supinated and held there, enabling him to walk on the outside of the foot this way (indicating) instead of walking on the inside of the foot this way (indicating), which is a very painful, uncomfortable, and disabling gait. In this right leg, on account of the presence of some power in the calf muscles —and remember that in poliomyelitis anterior we frequently see part of the muscles paralyzed and not the entire muscle—it is our intention to put the foot up in a plantar flexed position like that and hold it there in plaster of Paris and give the tendo achillis a chance to contract, at the same time stretching out the extensor tendon in the dorsum of the foot. It is a physiologic law that when muscles or tendons are relaxed they have a tendency to contract, and they do contract. If we can hold that foot long enough we can get that tendo achillis straightened out. After the cast is off we frequently put on a brace which holds the foot in that position. He can then put on a shoe over the brace and walk with the heel slightly elevated and the knee slightly bent. It does not do for him to wear the shoe during the day and take it off at night. Whatever apparatus is put on to overcome the contraction of the overstretched tendon must be worn constantly. While we are operating on the left foot we will put the cast on this leg, which will hold the foot down and hold the knee straight in an extended position and keep it there until the tendo achillis has had a chance to straighten up enough to enable him to get along without a brace. After we finish with that foot, if the tendo achillis and its muscles do not develop enough to hold the foot in extension, we can easily do a Gallie operation and so hold the foot in extension.

Operation.—It is necessary in doing these tendon transplantations to use a constriction on the limb so that the field of operation may be practically bloodless. It not only facilitates the operative technic, but it is much better so far as the reparative process is concerned not to have the tendon and tendon sheath surrounded by large clots of blood which have to undergo organization and absorption. We try to keep the operative field as free from blood as possible for that reason. Let me say that in putting on a constrictor it is always wise to protect the skin by putting a towel between the constrictor and the skin. If you take a rubber constrictor of the type which is usually used—1 inch wide strong elastic rubber—and put it around the leg without first putting on a towel, it will often result in a very uncomfortable sore place from the prolonged pinching of the skin between the layers of rubber. If you put a towel between it and the leg the towel prevents the skin from becoming pinched and adds much to the patient's comfort

I want you to see the peroneus longus tendon when I attempt to supinate the foot. You see the peroneus longus takes its origin up in the calf muscles, runs down behind the external malleolus, underneath the base of the fifth metatarsal bone, across the body of the foot, and becomes attached to the head of the first metatarsal on the inside of the foot. The tibialis anticus and posticus are gone and the muscles on the opposite side of the joint keep on shortening and shortening until the deformity which you see here and which is known as valgus is produced by three things: First, gravity pulling the foot downward; second, the weight of the body pulling on the foot in a distorted position, and, above all, the contraction of the non-paralyzed muscles. There are three factors producing the deformity and we propose to do away with them by transplanting the non-paralyzed tendon from the position where it is doing no good to a position where it will be useful. Second, we are going to make sure of the usefulness of that tendon by producing an arthrodesis on the inner surface of the foot between the scaphoid and astragalus, that is, we do away with the joint that exists between the scaphoid and astragalus and make one solid bone, in other words, an arthrodesis. Then we put the foot up in plaster of Paris and hold it there until the tendon has had a chance to contract and become attached to the bone on the inside of the foot and until the region of the obliterated joint has become solid.

A long incision is made from the belly of the muscle along the peroneus longus tendon down to the outer side of the foot where it passes underneath the fifth metatarsal bone. The tendon sheath is opened in this way, exposing the tendon. That at once exposes the peroneus longus tendon right down to the angle on the outer surface of the foot where it passes underneath the fifth metatarsal. You can see the size of the tendon. You can see the tendon sheath. I have bared the tendon and here is the tendon sheath. You see how very thin the tendon sheath is and how large the canal is underneath the fifth metatarsal where the tendon passes across the bottom of the foot. That tendon is picked up and isolated from the surrounding tissue. Then the tendon is sharply divided way down in the canal as far as you can go so as to get as long a tendon as possible. Now in taking that tendon out of its sheath we do so because we do not need the tendon sheath, as we are going to supply a new one. We take care not to disturb the lateral ligaments. I do not split the tendon sheath all the way up, because if I do I would partly destroy the lateral ligaments, but I split the tendon sheath above and below the lateral ligaments and then pull the tendon through (Fig. 97).

Now the tendon is ready to be transferred to the other side of the foot. The first step will be the insertion of the silk sutures.

In putting the silk into the end of the tendon it is very necessary not to constrict the tendon enough to shut off the circulation, because you see we have denuded the tendon of its sheath, and as the circulation of the tendon was largely carried in the small vessels of the tendon sheath, any constriction of the tendon may

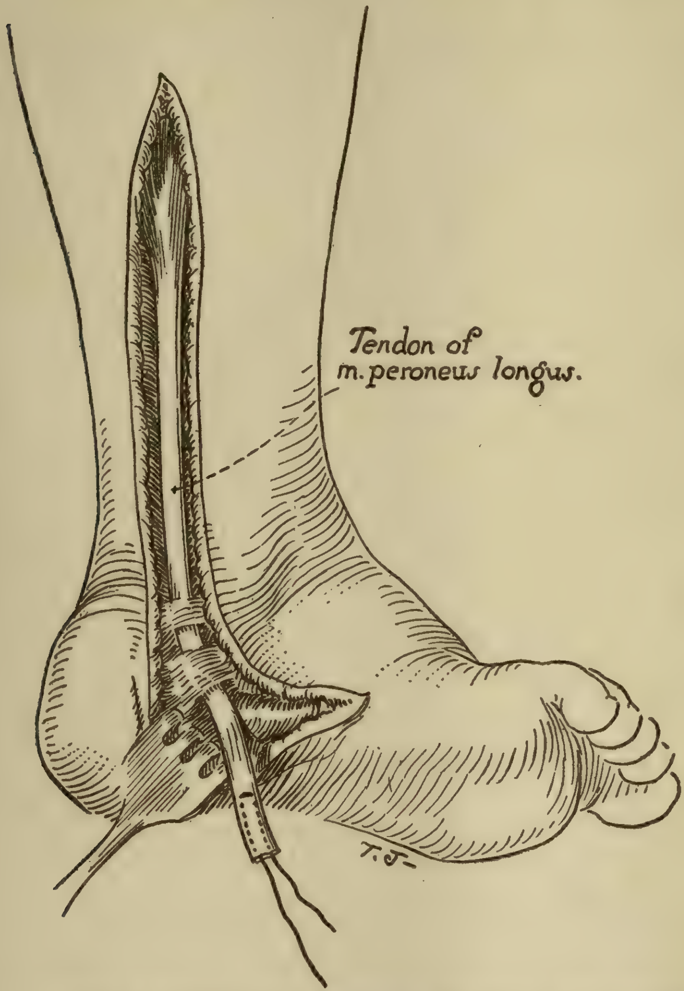


Fig. 97.—Tendon of peroneus longus dissected out, leaving the lateral ligaments of ankle. Note method of attaching silk suture.

seriously impair its blood-supply. Consequently, the needle is introduced in the end of the tendon and is carried up through the tendon longitudinally and then across at a right angle, and then back again on the other side in a longitudinal direction, both ends of the silk coming out through the end of the tendon. You see how strongly that is attached and yet I have not constricted the tendon in any way. In order to make sure, because there is going to be a good deal of traction on this particular tendon, I carry the suture back in this way and through once more. Now I have the silk anchored to the end of the tendon in such a way that it will not pull out (Fig. 97).

Now we turn the foot over and look for the tendon of the posterior tibial, which is a paralyzed tendon. The tendon will be smaller, of course, on account of some atrophic changes because of the lack of function. We know the tendon comes across behind the malleolus, attaching at the inner border of the scaphoid and along the base of the first metatarsal bone. We shall make a small incision over the place where we think the tendon ought to be. You see the tendon right at the bottom of the long incision, lying in this groove behind the internal malleolus. It is very easily picked up and demonstrated to you. I am not going to use it because the muscle from which it takes its origin is paralyzed. I am simply going to use the sheath in which that tendon is buried to manufacture an artificial sheath for the peroneus longus which I am going to bring over on this side of the foot. I carry this probe right up the sheath of the posterior tibial until it arrives opposite the body of the peroneus longus. With a blunt dissector I split the tendon sheath and draw the tendon out. You see the end of the probe has gone up to the body of the posterior tibial muscle in the sheath of the posterior tibial tendon and I have split the septum between the peroneus longus and the posterior tibial (Fig. 98). Now instead of taking the peroneus longus back on the outside of the foot, we will take it back on the inside of the foot, and it becomes a supinator instead of a pronator. I have brought the new tendon down on the inside of the foot to take the place of the posterior tibial. I have taken the tendon from the outside, where it was a pronator and where it was pulling the foot outward in a desperate position, and transferred it to the inside of the foot where it becomes a supinator and actively useful.

Now the next thing is to fasten that tendon. This tendon is carried right down and inserted at the periosteum at the point

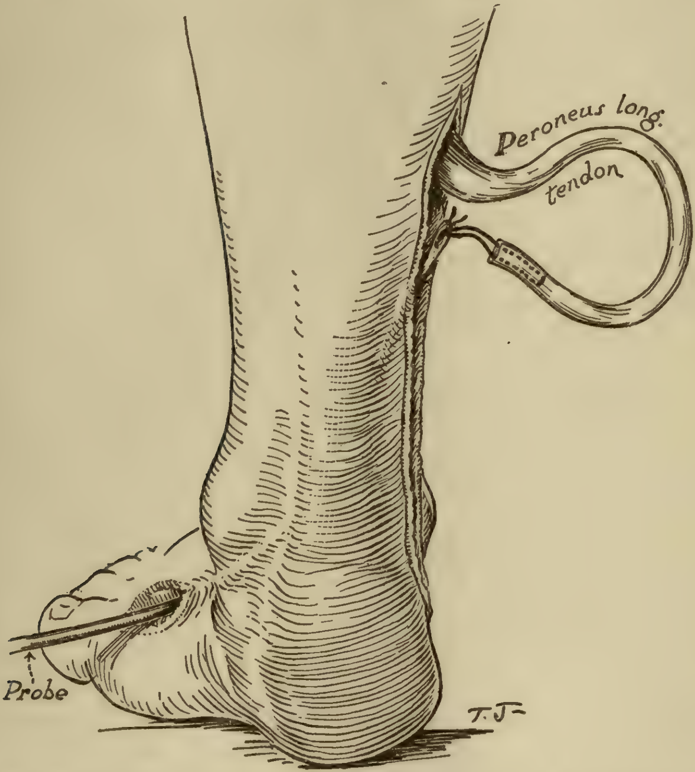


Fig. 98.—Probe inserted in sheath of tibialis posticus, passed through the intermuscular septum, and attached to end of peroneus longus tendon.

of insertion of the posterior tibial. I want most of you to see the depth of the insertion of that little paralyzed tendon. Here is the posterior tibial, a little, small, weak tendon. There is its point of insertion underneath the scaphoid and the base of the first metatarsal. Here you see coming down in the same sheath a strong active functioning tendon, which we propose to put in the place of the posterior tibial to take up the function of supination instead of pronation. In order to make that more successful and take some of the strain off the tendon we ankylose the joint between the scaphoid and astragalus, and that is done in this way. Here is the inner border of the scaphoid. Here is the astragalus. By careful dissection we take away the ends from both bones and let them grow together as one bone. I have split open the capsule that covered the astragaloscaphoid articulation right here. Now my knife is right in the joint. That little incision opens the articulation between the scaphoid and the astragalus. Remember in these little youngsters the articular surfaces are not only cartilaginous, but the greater part of the bone is cartilaginous and it only takes a little effort to separate them. I have taken off the end of the astragalus where it articulates with the scaphoid. I am taking off the articulating surface of the scaphoid. You see the end of the bone with the cartilage taken off and the bare bone left. I split the capsule in that direction in order to expose the articulation of the two bones; when I close this incision it has the effect of bringing the end of the scaphoid up against the astragalus. Closure of the incision amounts to a reconstruction of the capsule and of the astragaloscaphoid ligament, both of which were partially severed in exposing the joint. I shall reinforce my first suture line by placing over it a second layer of stitches. After I tie that suture it practically closes the entire incision in the capsule and pulls the denuded surfaces of the bone together. Now I have closed up the gap in the capsule and in the ligament and we are ready to insert the tendon which we have brought down. At the point of insertion of the posterior tibial I divide the periosteum which covers the base of the first metatarsal bone, and into that slit I sew this tendon which I have brought down. We never sew one tendon to another, though both tendons may be alive. If we want to transplant a tendon we sew the transplanted tendon right to the bone. That is done so that it may develop an attachment similar to its normal attachment, one which will withstand the wear and tear of daily use. In order to suture the tendon to the bone I have split the periosteum like that (indicating).

Now it is my intention to carry that tendon right into the periosteum, and in order to do that one end of the silk is carried into the slit and out through the periosteum on one side, and the other end is carried in through the slit and out through the periosteum on the opposite side (Figs. 99 and 100). You see, with both ends tied, this suture brings the end of the tendon right down into the periosteal slit, and at the same time sews the periosteum over the end of the tendon. The object is to get the end of the tendon below the periosteum. I have sutured the peroneus longus tendon subperiosteally at the base of the

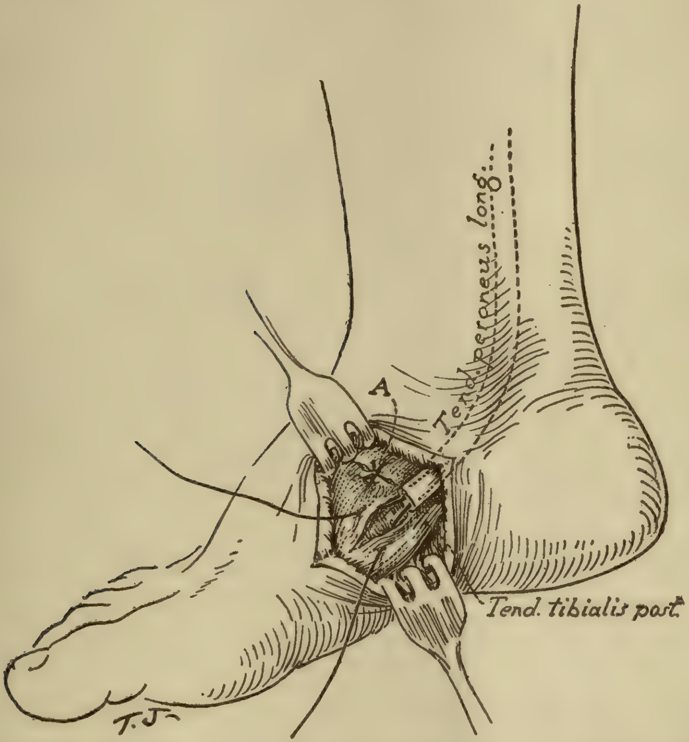


Fig. 99.—Tendon of peroneus longus brought down in sheath of tibialis posticus and first anchoring stitches introduced through the split periosteum. The closed wound is shown at *A*, where the articular surfaces of the scaphoid and astragalus have been denuded and the capsule repaired.

first metatarsal, and if the silk holds the tendon will grow to the bone, and I will have converted a useless tendon into a tendon that is of value to the patient.

I have been annoyed in this operation more by oozing of blood than usual. Generally the constriction is sufficient. I think the constrictor was put on a little hurriedly without waiting to evacuate the blood from the small vessels.

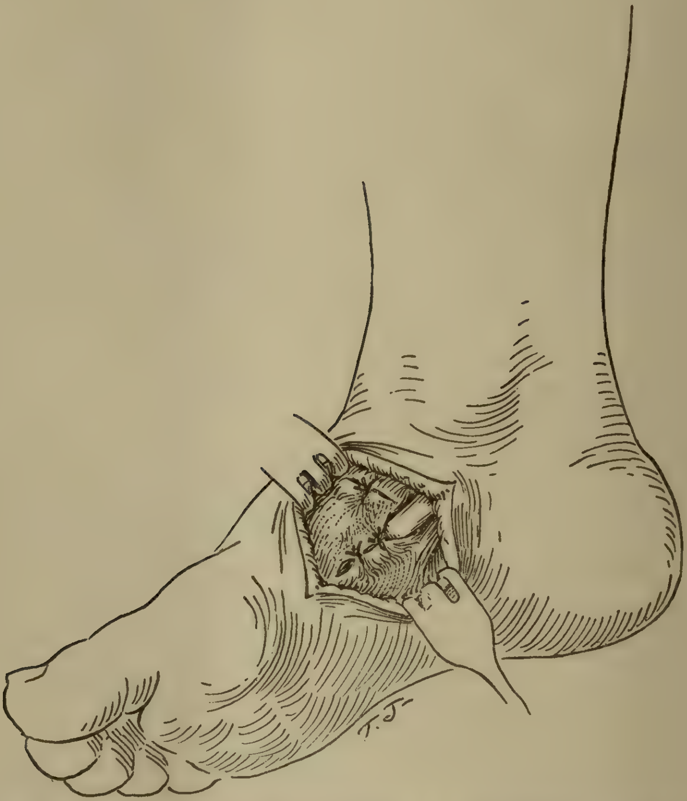


Fig. 100.—The peroneus longus tendon anchored in the periosteum. The sutures include both periosteum and tendon.

You can easily see the peroneus longus tendon at the bottom of the wound sutured to its new attachment. Now it is very necessary to cover that tendon with fascia before closing the skin. Every once in a while in tendon transplantations in which the tendon lies close to the skin and has not been covered with fascia, the tendon becomes attached to the cutaneous scar so that tendon and skin move together. We simply sew the fascia over the tendon and then sew up the skin. There must be no tension on that tendon from now until we get it into the plaster-of-Paris cast. The original incision through which we exposed the peroneus longus tendon will be closed in the same way so as to bring the edges of the fascia together. Now we will remove the constrictor and you will see how little bleeding takes place. As long as we cut only the skin, fascia, and fibrous tissue and do not make an incision into the muscle there is but little bleeding. You notice that the annular ligament of the joint is undisturbed.

CLINIC OF DR. PHILIP H. KREUSCHER

Mercy Hospital

HALLUX VALGUS

Summary: Hallux valgus a fashion deformity—mechanism of its production; pathology of bunion; palliative treatment; operation affords only hope of relief in advanced cases; technic of operation.

This patient, a male aged fifty, came to the hospital because of a double hallux vagus. There is no history of previous illness or injury to the feet. The history of the present trouble dates back ten years, when patient first noticed a prominence at the right metatarsophalangeal articulation. This condition, at first only slightly annoying, became painful after a number of months. In an effort to avoid putting his full weight squarely on his right foot most of the weight was thrown upon the left foot. Finally, an enlargement was noticed at the metatarsophalangeal articulation of the left foot. The narrow-toed shoes, which were being worn at that time, caused this patient's trouble very materially, and eventually brought about a very marked deformity of the foot (Fig. 101).

Hallux valgus has always been spoken of as a fashion deformity, and is considered a disease arising from the wearing of boots which are narrow-toed. This causes abduction of the great toe, until finally overlapping of neighboring toes takes place. The great toe may lap over the second and third toes, or the second and third toe may occasionally overlap the great toe. Normally the great toe extends directly forward from its metatarsal joint and slightly adducts and flexes when the patient takes a step. Abduction of the great toe is an abnormal deformity and may become very extreme under certain conditions. As the toe is slightly abducted the patient, to avoid pain, pushes the foot off the ground from the inside instead of using the proper heel-and-toe method of walking. As the toe turns outward it necessarily impinges upon the second toe and pushes backward and inward at its own metatarsophalangeal articulation. This causes a prominence at that point, and by the constant irritation of the shoe on the bones a greatly enlarged and thickened bursa forms over the head of the bone in that position. By means also of the continued irritation the head of the metatarsal bone becomes enlarged and an exostosis together with a marked thickening of the periosteum appears on the inner and dorsal aspect of the metatarsal bone. By further abduction of the toe a lateral subluxation takes place, and because of the wedge-like action of the base of the subluxated phalanx the first metatarsal is pushed upward and inward leaving a wider space than normal between the heads of the first and second metatarsals (Fig. 101). The

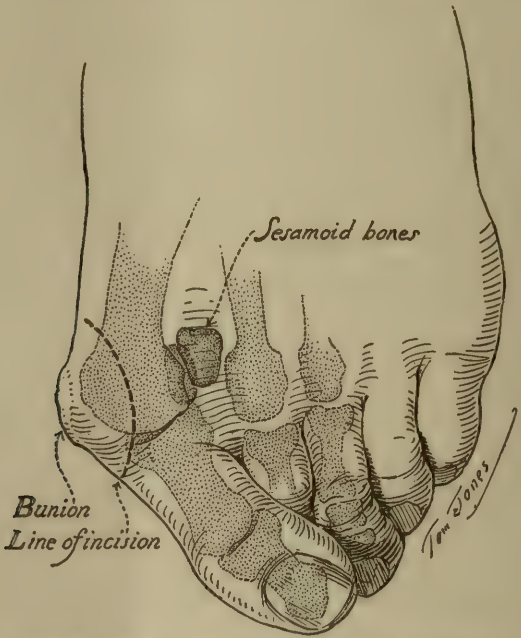


Fig. 101.—Marked hallux valgus deformity. Note position and size of sesamoid bones in flexor tendon, which may have caused the abnormally wide space between the metatarsals at this point. Line of incision for operation is shown.

internal capsule of the joint becomes stretched and thin and occasionally perforated. The external portion of the capsule becomes shortened and thickened. Very frequently the false bursa becomes inflamed and occasionally infected. Infections in this position may give rise to a very severe cellulitis, and by extension a severe arthritis in the metatarsophalangeal articulation. The flexor tendon of the great toe instead of lying well underneath the metatarsophalangeal articulation is displaced outward, and the sesamoid bones which lie in it may become displaced externally to the head of the bone and may further act as a wedge to push it inward and thus increase the deformity (Fig. 101). The extensor tendon frequently becomes shortened and acts as a bowstring in drawing the tip of the toe upward and outward.

The palliative treatment for the relief of hallux valgus should be greatly discouraged except in the very earliest stages. When a bunion is very small and not extremely painful, a properly fitted shoe with a heavy stiff sole may afford some relief. The wearing of pads of felt between the first and second toes sometimes lessens the deformity. As a rule, toe posts in the shoes have not proved very satisfactory. Various forms of bunion splints are on the market and have been recommended, but usually the parts are so sensitive that even these appliances cannot be worn comfortably. Of all the palliative measures which have been recommended, a proper arch support of both the longitudinal and transverse arches has given most relief. Daily manipulation with mild massage over the outer and upper aspects of the articulation may act in keeping the tendons and ligaments stretched. In advanced cases only operative treatment should be tried. There are four distinct steps in the operation for hallux valgus: 1. Removal of the false bunion, which in itself is quite useless. 2. Amputation of the hypertrophied portion of the head of the metatarsal bone or excision of the entire head. 3. Removal of the sesamoid bones from the flexor tendon. 4. Elongation of the extensor tendon in those cases where the great toe overrides the next toe. The incision is made over the inner and dorsal aspect of the articulation (Fig. 101), thus exposing the capsule of the joint.

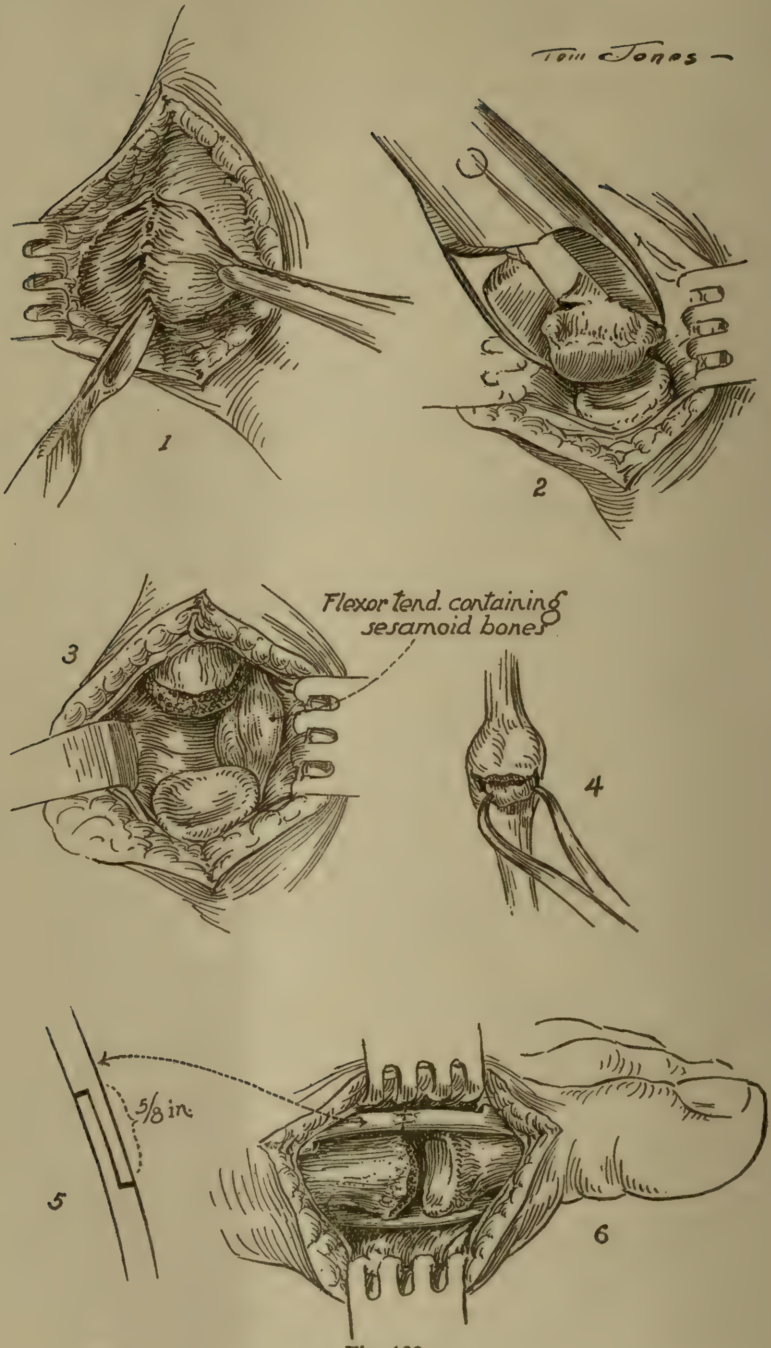

Tom Jones
1
2
Flexor tend. containing sesamoid bones
3
4
5/8 in.
5
6

Fig. 102.

The false bursa is first exposed and can be easily dissected out (Fig. 102, 1). Then by an incision through the capsule of the joint the enlarged and deformed metatarsal head is exposed. The toe is drawn downward, and with large bone forceps or chisel the hypertrophied portion may be removed or the entire head of the metatarsal bone is amputated (Fig. 102, 2). The raw end of the bone is then shaped as nearly as possible like the original head. By extending and flexing the great toe the flexor tendon with its sesamoid bones comes plainly into view (Fig. 102, 3). The sesamoids must be removed. An incision is made into the tendon and the sesamoid bone is grasped and evulsed (Fig. 102, 4). The removal of the sesamoid bones frequently, as in the case which I am demonstrating, requires one-half of the time for doing the complete operation. They are very frequently firmly adherent to the tendon itself. Care must be taken not to divide the tendon entirely. If this accident should happen the ends must be reapproximated and sutured. Without making a new incision the sheath of the extensor tendon is exposed, opened, and the tendon drawn out. This tendon must be lengthened, usually from $\frac{2}{5}$ to $\frac{5}{8}$ inch (Fig. 102, 5, 6). The tendon is replaced into its sheath and the sheath sutured with fine catgut. If the smooth articular surface of the phalanx is normal and has not been injured in the course of the operation, it is not necessary to interpose a flap of fat and fascia. If the articular surface above mentioned has been disturbed, a fascia flap may easily be taken from underneath. This I did in one of my early cases and obtained a very good result. The operation having thus been completed, the capsule of the joint is closed and the skin closed with horsehair. By this operation the great toe is shortened by means of the removal of the head of the metatarsal bone. This is of no consequence at all.

Fig. 102.—1. Removal of bunion, *i. e.*, the greatly enlarged and thickened bursa. 2. Removal of enlarged and deformed head of metatarsal bone. 3. The head of the metatarsal bone has been removed. Note size and position of sesamoid bones in flexor tendon. 4. The tendon has been split and a sesamoid bone is being removed in the grasp of a tenaculum. 5. Diagram of method of elongating tendon. 6. Position of bone ends and relation of tendons when operation is complete and before extensor tendon has been replaced within its sheath.

I wish to emphasize that this operation must be done without hand contact and as aseptically as for an arthroplasty of any of the larger joints. The entire foot and space between the toes must be carefully prepared and sterilized the day before the operation, and covered with a sterile dressing. Immediately before the operation the skin is again carefully treated with alcohol and ether, paying special attention to that portion between the toes. A covering of gutta-percha solution, which is a 1 per cent. gutta-percha in acetone, is then applied over the entire foot. I make it a point always to treat the toe-nails and space underneath the tip of the nails with pure tincture of iodin. I have seen several very severe infections following this operation where the operator was careless in his preparation and indifferent in his operative technic. After the operation is completed a sterile dressing is applied and a wedge of sterilized felt or cotton is placed between the first and second and third toes, and the whole wrapped in a dressing of gauze and cotton without any further immobilization. Active and passive motion is started on the tenth day after the stitches have been removed.

A CASE OF BOW-LEGS TREATED BY OPEN OPERATION

Summary: Child three years of age presenting extreme bilateral rachitic deformity of tibia and fibula; correction by multiple incisions on concave side of deformed tibia and manual straightening without production of complete fracture.

This patient is a female aged three years, with the signs and symptoms of a clearly developed case of rickets. Previous illnesses are negative. This child was placed under treatment for a number of months, at the end of which time an operation for the correction of the terrific deformity (Fig. 103, 1) was undertaken. It will be noted that there is very little curvature of the upper end of the tibia. There is scarcely any in the femur. Inward curvature over the lower third of each tibia is so great that the lower articular surfaces point toward each other. This child walks with great difficulty and places all of its weight on the outer aspect of the foot and ankle. I believed it impossible to correct this deformity by mere fracture of the bone, and I believed it quite improbable that a good result could be obtained by a single transverse cut in the tibia as is so frequently practised. I wish in this case to make three or four transverse cuts in the lower end of the tibia sufficiently deep so that I will be able to straighten the tibia forcibly without making a complete fracture. I shall not disturb the fibula at all. I am making the incision over the lower end of the tibia, and, if necessary, will make a smaller one higher up. This incision, you see, is not over 1½ inches long (Fig. 103, 1). I have now exposed the bone, and with the artist's chisel I am making my transverse cuts through the bone. I am not taking out a wedge on the opposite side. I have made two transverse cuts and will make a third a little higher up through the small skin puncture which is not more than ½ inch in length (Fig. 103, 2). By grasping the foot by the right hand and with the left hand grasping the shaft of the tibia, having placed both thumbs over the outer aspect of lower end of the tibia, I can easily straighten it, as you can see (Fig. 103, 3). I will do the same operation on

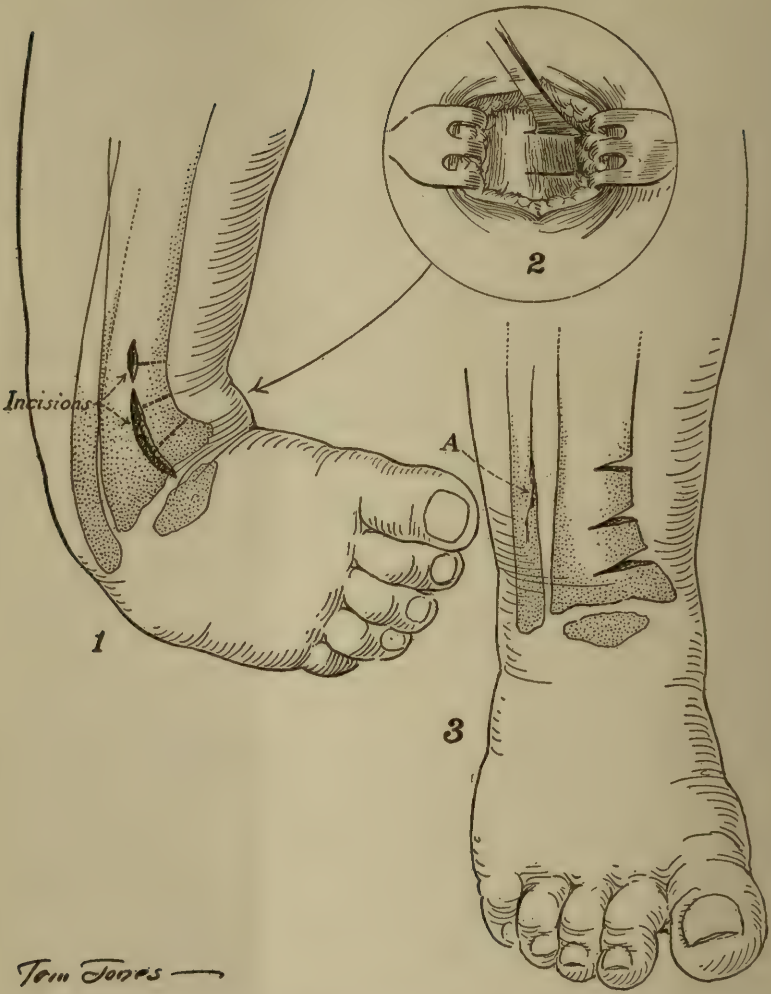


Fig. 103.—Bow-legs: 1. The marked deformity, emphasized by the angle which the articulating surface of tibia makes with the long axis of the tibial shaft, is well shown. Note the long and short skin incision. Dotted transverse lines represent the positions of bone division. 2. Method of cutting bone with artist's chisel through lower incision. 3. After operation. The deformity corrected. Note the wedge-shaped spreading of the transverse bone cuts. This spreading of the cuts, accomplished by force, permits the bone to straighten as shown. *A*. Greenstick fracture of fibula

the opposite leg. By making this type of cut in the bone I will get but a small elongated wedge at the inner portion of the bone. These gaps will fill up very much more quickly than if I had made but one transverse cut. You see that now the articulation points downward in a line with the straightened shaft of the tibia and that the foot can be placed on a flat object which is at right angles to the line of the shaft of the bone. I will now close the skin with horsehair and apply a sterile dressing. A cast will be applied extending from the base of the toes to the groin, and this one or a similar one will be kept on for at least four months. During this time the patient will be kept on a proper diet and medication of cod-liver oil and phosphorus.

CLINIC OF DR. WILLIAM M. HARSHA

ST. LUKE'S HOSPITAL

(Given at the Surgical Congress of North America, October 24, 1917)

DEMONSTRATION OF CASES

Summary: Case I. Absolute pyloric obstruction with complete ptosis of stomach; posterior gastro-enterostomy; recurrence of ptosis and obstruction after operation relieved by elevating foot of bed; result after three months.

Case II. Aberrant thyroids—usual locations; methods of approach to base of tongue.

Case III. Separation of lower epiphysis of femur—fixation obtained by nailing; result after three years.

Case IV. Gonococcal arthritis—management.

Case V. Kondoleon operation for lymphedema—pathology of non-filarial lymphedema—result after two years.

CASE I.—This patient, a woman about forty years of age, came to the hospital last July with the diagnosis of gall-bladder trouble. At that time she weighed but 97 pounds and had not been able to retain a mouthful of food for three weeks. *x*-Ray plates showed a complete ptosis—the stomach was down in the pelvis. Not a particle of bismuth had passed through the pylorus in nine hours. The woman was cyanotic, with a temperature below normal, and was the most emaciated patient that I have seen in a long time. The Ewald test-meal showed a normal acidity and no evidence of malignancy. Neither did the *x*-ray pictures suggest malignancy. The gastric shadows were smooth in contour. In short, there was nothing except the obstruction. The diagnosis was pyloric stenosis, probably the result of chronic ulcer.

The patient was operated on. There was a puckered scar completely closing the pylorus—apparently the result of a chronic gastric ulcer. The stomach was found in the pelvis. We drew it up into its usual position and did a posterior gastro-enterostomy with no loop.

Twenty-four hours after operation she suddenly developed complete obstruction. The chief point of interest in the case is that she did well for the first twenty-four hours, and then developed the obstruction. On examination it was found that the stomach had dropped back into the pelvis. I was reluctant to reopen the abdomen, and so put the patient in the Trendelenburg position to see if that would have any effect on the condition. The symptoms of obstruction immediately disappeared. This simply serves to show the mechanical influence of posture. If we had put the patient in the ordinary semi-Fowler position or let her lie flat we would not have accomplished anything without reopening. By putting her in the Trendelenburg position the stomach was forced back into its normal position and the obstruction disappeared. She then went along in the normal way. The operation was performed the 11th of last July and today she weighs 150 pounds.

Case II.—A woman thirty-nine years of age, unmarried. Nine years ago she had some kind of a growth develop on the base of her tongue just in front of the epiglottis. It developed to the size of half an English walnut and increased gradually for six months to the point of interference with deglutition and speech. She began to suffer severely from malnutrition. The tumor was too far back to get at through the mouth. We did a tracheotomy here (indicating) and gave the anesthethic through that opening. Then we made a Kocher incision and drew the tongue out under the chin. By prying the mouth open we could get access to the tumor. It was an aberrant thyroid, as shown by sections. We could not do a typical operation, but she made a very good recovery and has had no trouble since. You can feel a little tumor there yet, but it does not interfere in any way. It is eight years since the operation. There were bony elements in the growth. Parathyroids have been found in some of these cases as reported by others.

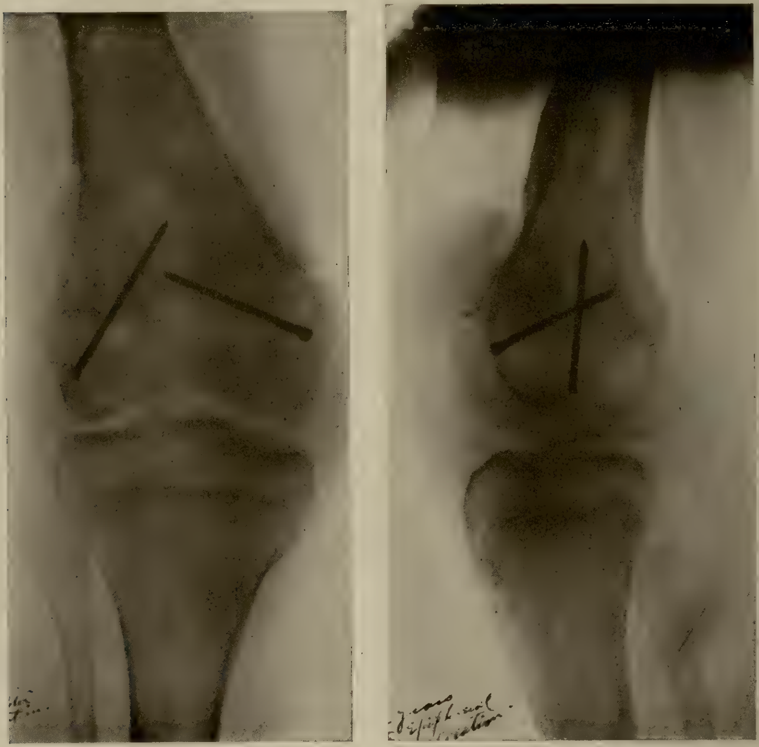
You are familiar with the different forms of aberrant thyroid. The most frequent form is found in the chest. They go down behind the sternum more frequently than they go upward. One case I had was enlarged to the extent that cyanosis occurred when the patient relaxed in sleep. A tracheotomy was done to save the life of the patient on one occasion, but the tube we ordinarily use for tracheotomy was not long enough, so we used a glass tube long enough to reach the trachea past the obstruction, and that was enough to give him temporary relief and enable him to take the anesthetic for radical operation. He made a good recovery after removal of the gland. In a case which I saw but did not operate on there was a growth beneath the tongue, elevating the tongue. It gave the appearance of malignancy, but was found to be an aberrant thyroid.

Case III.—This patient is presented in order to show you the result of a nailing of the epiphysis of the lower end of the femur. The patient collided with a street car about three years ago, when he was seventeen years of age. He had concussion of the brain with a base fissure, a Colles' fracture of one wrist, a fracture at the middle of the left femur, and an epiphyseal separation of the lower end of the right femur. When he was taken to the hospital nothing was done except to try to save his life. The fractures were neglected entirely. I saw him one month after the injury. The separation at the lower end of the femur was the important thing. The other fractures were easily handled.

At operation it was found that the lower fragment was displaced forward at right angles to the shaft. The ligaments and muscles were retracted. After nailing the end to the shaft these cut ligaments and the patellar tendon were too short to approximate. They were spliced by fascia from in front of the upper end of the tibia. The joint is not as strong as the other knee, but it was a choice of length or strength. The other thigh was shortened over ½ inch by the fracture, but has since grown until it is ¾ to 1 inch longer than the one operated on because of the cessation of growth at the operated epiphysis.

You will notice the nails are driven in in such a way as not to impinge on the articular ends of the bone. They have been in for three years and are causing no trouble (Figs. 104, 105). The only compromise of motion is that of flexion. He cannot quite bend the knee to the normal extent, but he can get it straight and has good functional use of the leg.

Case IV.—Here is a young man, twenty-three years old, who entered the hospital today. He had a Neisserian infection about the 10th of May—about five months ago. On June 2d, that is, after an interval of three weeks, which is about the usual time, as Dr. Murphy used to say, for Neisserian infections to metastasize, he had an infection in his left shoulder, which subsided in two or three days, to be followed by a more severe infection in the right hip. From June 5th to the present time he has had



Figs. 104 and 105.—*x*-Ray photographs (anteroposterior and lateral views) of a case of separation of the lower epiphysis of the femur taken three years and a half after fixation by nailing. Note nails in position with no evidence of inflammation about them.

some disability in the left hip. He has now no leukocytosis, no evidence of secondary infection, no fever, but this plate shows some degree of bone destruction (Fig. 106). Some ankylosis is present as shown by the marked loss of motility at the joint.

The question in this kind of a case, where there is no mixed infection, but with some destruction of bone, is, What is the best method of treatment? It is now four months since the onset. It is barely possible that he may get along without complete ankylosis by using extension or by having adhesions broken up under an anesthetic later. I am reminded of a case I saw some years ago in which there was an infection of the same type of both knees. Both of them filled up very full of fluid. We aspirated one joint and

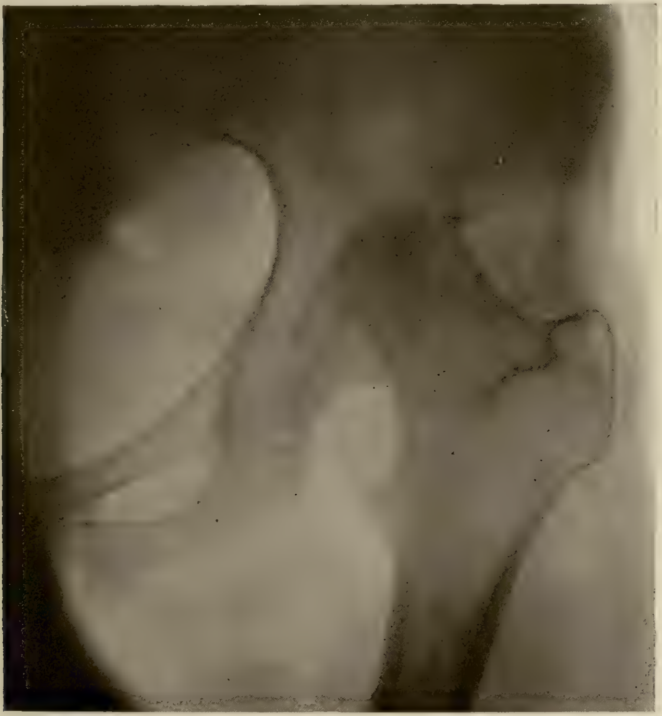


Fig. 106.—*x*-Ray photograph showing almost complete destruction of femoral head with beginning bony ankylosis as the result of a gonococcus arthritis of six months' duration.

let the other absorb by the usual method of treatment. The result was that in the joint I aspirated the patient got some degree of fibrous ankylosis, while in the one I did not aspirate he had a good joint. It seems to me that if the fluid is withdrawn from such joints gradually there is less danger of adhesions between the joint surfaces. At present we try to get along without any operative procedure except to wash out and disinfect the joint in the early stage. It is not very often that we have just the hip involved in a single joint infection due to the gonococcus. It is about the fifth or sixth in the order of frequency, the wrist, fingers, shoulder, and elbow coming first.

The doctor asks me if the patient has shown any sign of heart trouble. There has not been any. The process began in the left shoulder, left it suddenly without leaving any permanent disability, and went to the hip, where it has remained to the present time. Gonococcus endocarditis is relatively rare.

I am reminded of another case I had with twice as much destruction and shortening in a young man of the same age and from the same cause. I did not see him until the hip was too far ankylosed in adduction to be able to do anything for him in the way of saving the hip. Dr. Ridlon saw the case with me, and there was so much destruction that it was thought best to do a subtrochanteric osteotomy, that is, to go in and chisel the bone through sufficiently to permit it to be fractured and then dress the limb in abduction. That was done, and now he has very good function of the limb even with the hip ankylosed (Fig. 107).

In this case we shall keep up extension until the flexion and adduction deformity is overcome and the joint surfaces separated. The entire limb will then be put in a plaster cast in abduction. We expect a good result.

Case V.—A. W., aged twenty-three. *Family history* negative.

Personal History.—Had the usual diseases of childhood. Was vaccinated against smallpox three times before the age of nine, always on the leg, with negative result. The last time, the patient being then about nine years old, she was vaccinated on the *left* leg. There was no apparent result, but in one month there developed a lymphangitis, almost of the erysipelas type, beginning on the leg vaccinated and extending in patches—not continuously—over the lower abdomen and down the right thigh.

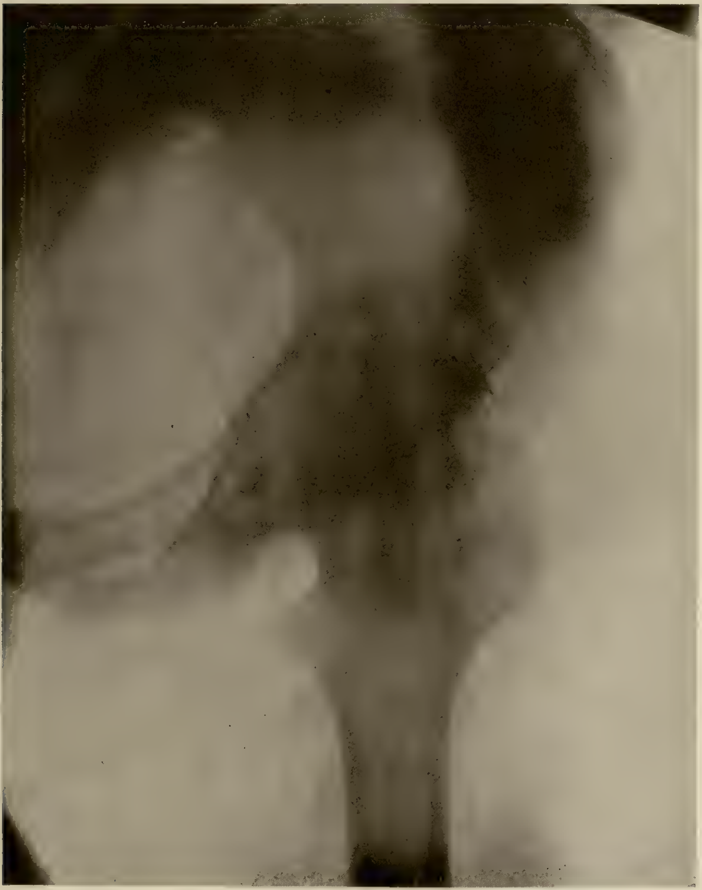


Fig. 107.—*x*-Ray photograph taken three years after subtrochanteric osteotomy of the femur and fixation in abduction to correct the flexion-adduction deformity in a case of complete bony ankylosis of the hip, the result of gonococcus arthritis.

This process lasted several weeks, attended by temperature of 103.4° F. Suppuration occurred in one place—streptococci were found in the pus. The limbs began to enlarge soon after and continued to increase in size with her growth and development.

Twice there have been relapses or recrudescences, with suppuration at one or two places.

These relapses have not been caused by any recognized injury. Apparently there has been a blocking of the superficial "lymph trunks," greater in the left leg than in the right, as the result of these repeated attacks of streptococcus, erysipelatous lymphangitis.

When she came to the hospital the left leg at the calf measured 30 inches around. After elevation and the application of a compression bandage the circumference was reduced about 3 inches.

In May, 1915, we did a Kondoleon operation. The limb was elevated and an Esmarch constrictor applied. Then an incision was made on each side from the knee to the malleoli, through which the skin with a small layer of fat was undermined, almost completely encircling the leg. The fat and boggy connective tissue was then dissected off down to the deep fascia covering the muscles. This deep fascia was removed in strips 1 inch in width, leaving a space of 1 inch or more between the neighboring denudations. The deep fascia is a barrier between the superficial and deep lymphatics, the only anastomosis being through the lymph-nodes. Stripping off parts of the deep fascia permits direct anastomosis and, hence, drainage in case the superficial lymphatics, as in the present instance, become obstructed.

The healing was slow, and not entirely free from infection, which was of the same type as the original in respect to its bacteriology. The limb, as you see, is nearly or quite of normal size, but not entirely symmetric. This is probably due in part to uneven dissection, but it is also due to a recrudescence—lymphangitis with suppuration—which occurred in the spring of 1917.

The disability she formerly had has been removed by the operation, and she can walk as well as the average girl; and with the modern "sky scraper" shoes and short skirts makes an average appearance.

CONTRIBUTION OF ROY L. MOODIE, PH.D.

DEPARTMENT OF ANATOMY, UNIVERSITY OF ILLINOIS, COLLEGE OF MEDICINE, CHICAGO

PATHOLOGIC LESIONS AMONG EXTINCT ANIMALS: A STUDY OF THE EVIDENCES OF DISEASE MILLIONS OF YEARS AGO

Summary: Evidences of diseases among ancient man and fossil animals known as paleopathology. Disease unknown for the first three-quarters of the history of life on earth. Fracture and callus among fossil vertebrates. The nature of callus 20,000,000 years ago. Necrosis and hypertrophy, exostoses, and their causes among extinct animals. Bacteriology of the past. Bacteria among the oldest evidences of life 100,000,000 years old. Bacterial invasion of bone. Bacterial decay, fungi, and their evidences. Deforming arthritides of fossil vertebrates similar to recent arthritic lesions. Osteoma from a swimming reptile 16,000,000 years old. Hemangioma in the tail of a dinosaur 18,000,000 years old. The pathology of cave mammals the first to be studied. Bone pathology of early human races. No evidences of syphilis among extinct animals. Extinct diseases indicated among some of the lesions. Paleopathology just beginning to be understood. Study of fossil lesions does not change present conception of the nature of disease.

WITHIN the last few years the science of paleopathology has received considerable impetus from the studies of Ruffer, Elliot Smith, Hrdlička, and others on the pathologic anatomy of ancient races of man. Evidences of disease antedating the advent of man many millions of years are also known and have been partially studied. It is these later conditions which shall receive our attention in this place.

The age of these lesions is very great and must be measured by geologic standards; it being quite difficult to measure in terms of years the age of these ancient evidences of traumatism. If measured in terms of years, the age must be measured not by decades nor by millenniums, but by millions and tens of millions of years. While all writers on the age of the earth do not agree on the number of millions of years, they all agree that the history of life on earth has occupied many millions of years. A safe estimate of about 100,000,000 years may be made for the period of time during which life has existed on the earth. For the last one-quarter of this time, or 25,000,000 years, diseases are known to have occurred.

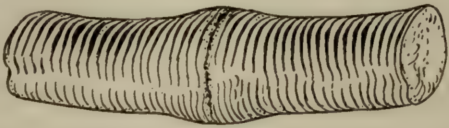


Fig. 108.—Portion of fractured rib of a Permian reptile.

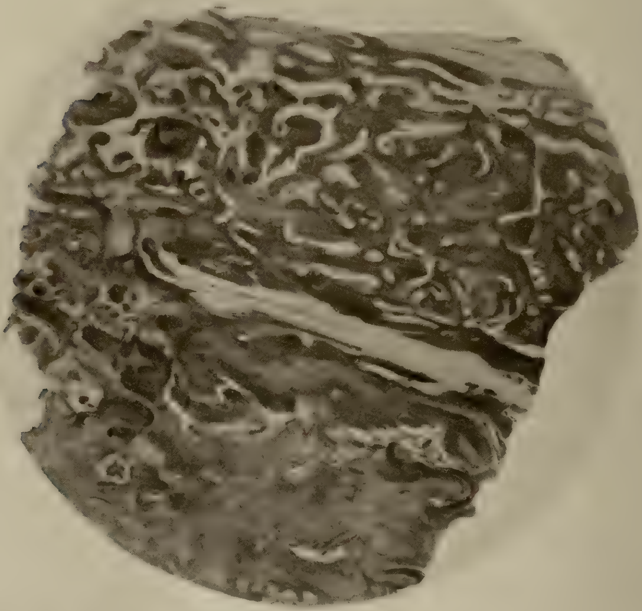


Fig. 109.—Microscopic section of above fracture and callus; × 300.

One of the oldest known indications of traumatism is a case of a fractured rib of a primitive reptile from the Permian of Texas, to which an age of 20,000,000 years may be assigned. The lesion is a simple fracture with some callus, and is typical of all of the fractures known among fossil vertebrates of pre-tertiary age. The rib portion is shown in Fig. 108. A microscopic section of this fracture shows many interesting things, as can be seen in Fig. 109. The section was made by well-known petrographic methods and may be made thin enough for oil immersion study.

The callus was quite evidently an old one, for the fracture was completely healed. The microscopic section shows many evidences of an old callus such as we are familiar with today. Osteosclerosis and osteohypertrophy may be mentioned as two of these indications. The region in the lower part of the figure I have interpreted as an osteosclerotic area, basing my conclusions on the absence of osseous trabeculæ and the presence of a heavy deposit of calcium salts or other inorganic substance. The white band running from right to left through the figure may be interpreted as a spicule of bone due to the splitting of the rib. Its bony nature is definitely established by the presence of lacunæ, and its presence is interpreted as an ingrowth of bony material into the cleft due to the splitting of the rib. The hypertrophied area may be observed in the upper right-hand portion of the figure, and is interpreted on the basis of the presence of numerous osseous trabeculæ. There is no evidence that the fracture was infected, necrotic sinuses being entirely wanting.

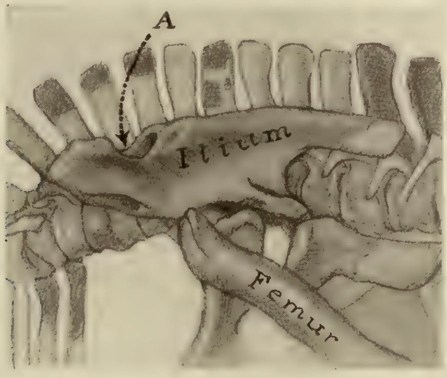


Fig. 110.—Pelvis of Camptosaurus, a large dinosaur, showing a necrotic sinus at *A*, in the posterior end of the right ilium.

An interesting case of traumatic necrosis is seen in the ilium of a large dinosaur, as shown in Fig. 110. The skeleton of this interesting reptile is mounted in the United States National Museum at Washington. The injury is on the posterior end of the right ilium and has resulted in a deep necrotic sinus, accompanied by considerable hypertrophy of the bone, as is commonly the case today in necroses. It is useless to speculate as to

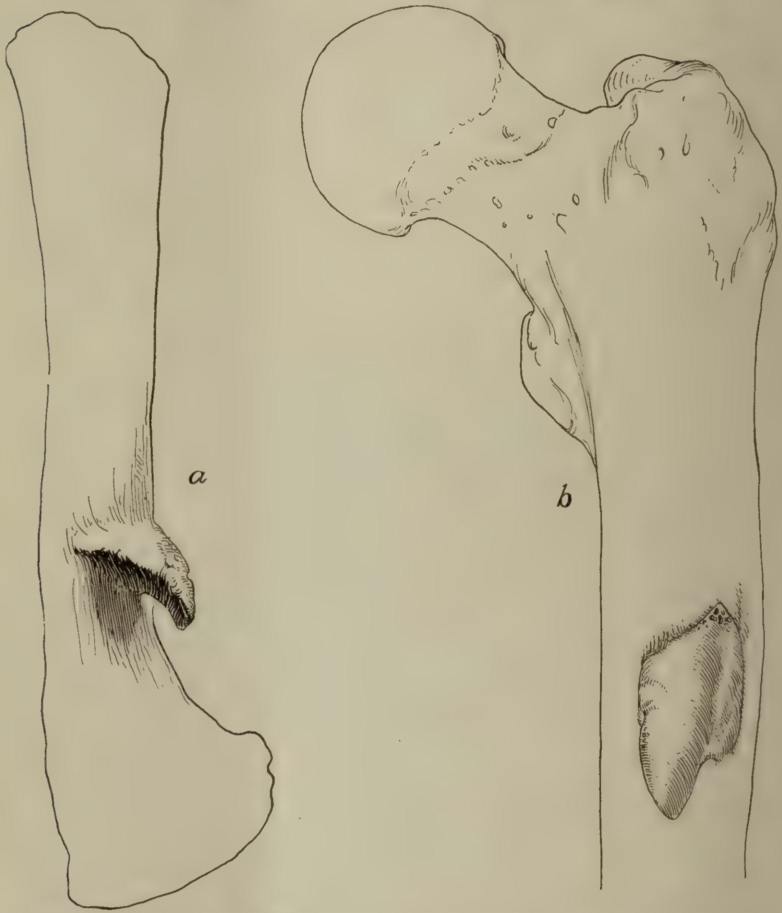


Fig. 111.—*a*, Scapula of Triceratops, 3 feet in length, showing on the visceral surface a hook-like exostosis, due to some chronic irritation; *b*, portion of human femur showing hook-like exostosis similar to that shown on the dinosaur scapula.

how the injury may have been received. Abel has suggested that the specimen represents a female and the injury was received during the breeding season.

Other traumatic conditions are known among the dinosaurs, and will be described elsewhere. One of the most interesting is that of an exostosis on the visceral surface of a scapula of Triceratops, one of the large three-horned dinosaurs from the Upper Cretaceous of Wyoming. The inner surface, on which the hook-like process appears, should be perfectly smooth, since the visceral surface slides over the ribs. This exostosis (Fig. 111, *a*) must have produced considerable laceration of the pleura. The lesion was possibly due to some sort of chronic irritation, or perhaps pulmonary infection. A lesion of very similar form is commonly seen on human bones, and one is figured herewith on a modern human femur for comparison (Fig. 111, *b*).

Another interesting example of necrosis is seen in one of the arm bones of a mosasaur, shown in Fig. 112, *a*. The mosasaurs were large swimming reptiles and are found abundantly fossilized in the Cretaceous deposits of Kansas. The necrotic sinus may be seen at the upper pole of the figure. It is a deep, irregular, rough-sided pocket, surrounded by a lipped surface, indicating the presence of an extensive suppuration. The accompanying hypertrophy and the nature of the sinus are shown in Fig. 112, *b*, which is a drawing of a sawn sagittal section of the bone. A diagnosis of tuberculous necrosis has been suggested by a French author as the cause of a similar lesion found among fossil mammals. Such a diagnosis in this case is wholly worthless. All we are justified in saying is that the lesion presents all of the aspects of a suppurative necrosis, suggesting the abundant presence of bacteria of a pathogenic nature.

Bacteria are among the oldest known evidences of life and are found associated with pre-Cambrian algæ in Montana. A photograph of some of the proterozoic bacteria is published herewith (Fig. 113). They are so readily comparable with modern forms of bacteria that little need be said about them. These bacteria were discovered by Doctor C. D. Walcott in his studies of the pre-Cambrian formations of North America, on

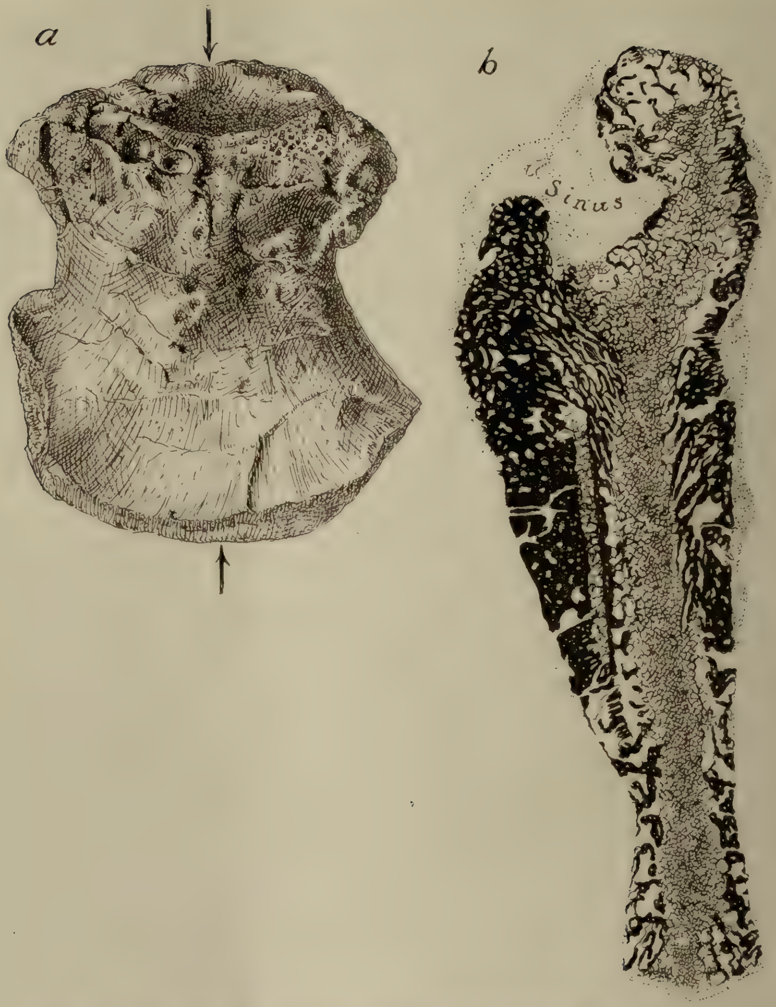


Fig. 112.—*a*, Arm bone, radius, of a swimming reptile from the Cretaceous of Kansas, showing roughened area, necrotic sinus, and hypertrophy. The necrosis was possibly due to bacterial activity; *b*, sawn sagittal section of same bone, taken in plane shown by arrows in *a*. The sinus is seen to be an irregular cavity, and immediately below this occurs an area of hypertrophied bone, evident in the blackened portion of the drawing. These areas are wanting in the small vascular spaces which are so abundant in the shaft of the normal bone.

which he has spent many years. The deposit in which the bacteria occur has many impressions of algæ. In the cells of these algæ the bacteria herewith pictured occur. The cell walls of the algæ may be seen in the long broad parallel lines, running across the figure. The bacteria were possibly not pathogenic, but are supposed rather to have been active in the deposition of calcium salts, and the limestones, in which the bacteria and algæ occur, are supposed to have been deposited by their action upon the sea-water. This action by algæ and bacteria of a similar nature is a well-established fact today. We can only read the history of the past on the basis of what we know of present events.

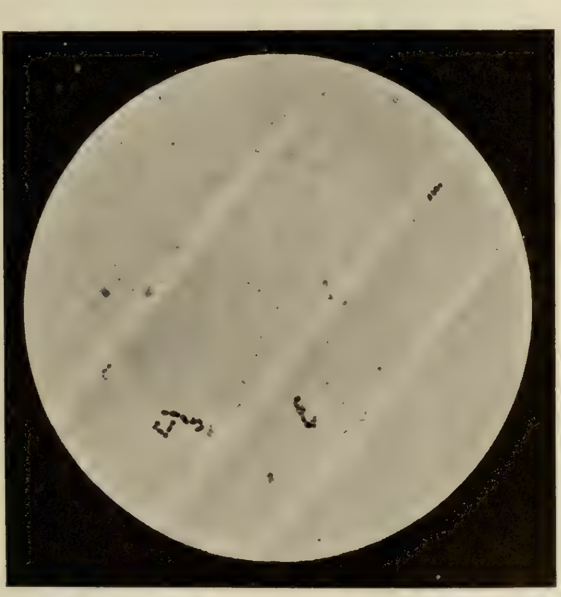


Fig. 113.—Fossil bacteria, designated as micrococcus, shown magnified 1100 diameters. There are three well-developed and characteristic chains of bacteria shown in the figure. The oblique striæ are the cell walls of the algal cells in which the bacteria occur. These bacteria are among the oldest evidences of life, and an age of approximately 100,000,000 years may be assigned to them.

Since the pre-Cambrian our knowledge of the occurrence of bacteria, fungi, and other disease-producing organisms is a blank until we come to the great Coal Period many millions of years later. In this period are found abundant remains of bacteria and fungi. These organisms are probably largely the organisms of decay, and we are ignorant as to what diseases they may have produced. The bacteria are well known and have been described by several writers. The organisms are found preserved in coal, decayed wood, petrified feces of fishes, and other places. In the petrified feces of fishes, which are well-known objects to paleontologists and to which they have assigned the name of "coprolite," the bacteria are especially abundant, as we would naturally expect. We are even able to arrive at some fairly good conception of the bacterial flora of the colon of these animals.

In pieces of bone from the fishes Renault has been enabled to work out the stages in the destruction of the lacunæ of the bone. In the nearly normal bone the bacteria, micrococci, are seen to be invading the canaliculi, and later stages are shown until the complete destruction of the bone is accomplished. Cultures of the bacteria frequently occur petrified in silicon, and an example of such a culture is shown in excellent photomicrographs by Renault. Mucoid capsules, which are so difficult to demonstrate today, are occasionally preserved in plant cells of the softer vascular plants of the coal period.

Fungi of many types are known and the fermentation of substances and the liberation of butyric acids by these plants is well established. Many of these early fungi were spore bearing, and the mycelia are often seen to bear sporangia, resembling in all essential respects the spore-bearing fungi of today. Later in the geologic history of the earth leaf-spot fungi were introduced and have become very well known.

Deforming arthritides of many types are well known among fossil vertebrates, but their dependence on any one form of traumatism is, of course, not established. Probably as many causes operated in the past to produce arthritic lesions as are in operation today. Among this large class of arthritides two will be mentioned here. One of them is a hemangioma (?) and the other is an osteoma. These lesions establish the presence of tumors in very early geologic periods. Osteosarcomata are so far unknown.

The osteoma to be described herewith (Fig. 114, *a*) occurs on or near the articular ventral surface of a dorsal vertebra of a mosasaur, one of the large swimming reptiles of the Cretaceous of Kansas. Many of these reptiles attained a length of 30 to 40 feet and some of them were over 50 feet. The animal to which the vertebræ herewith described belonged was about 25 feet in length. These reptiles are among the best known of the fossil vertebrates, and their skeletal remains are widely distributed in the geologic museums of the world. The bone tumor is an outgrowth of the bone, as may be seen in the sawn section shown in Fig. 115.

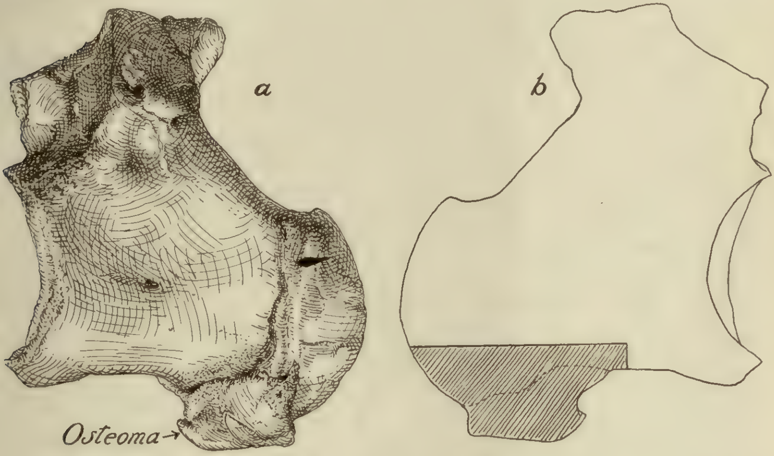


Fig. 114.—*a*, Lateral view of vertebra of a mosasaur, a swimming reptile from the Cretaceous of Kansas, showing the only known fossil osteoma. The vertebræ of these animals were of the ball-and-socket type, the so-called procœlous; *b*, diagram of a sawn sagittal section of the vertebra, showing in the shaded area the region drawn enlarged in Fig. 115.

The osteoma, for such it may readily be called, does not involve a great deal of the intervertebral surface, but has overlapped the junction of the two vertebræ, and by adhesion has formed a weak ankylosis. The greater part of the osteoma, however, lies on the posterior end of one of the vertebræ, and the arthritic lesion takes the form of a cup-shaped projection resembling the lesions seen in spondylitis deformans. The lesion as determined by a sawn section attained a thickness of 10 mm.

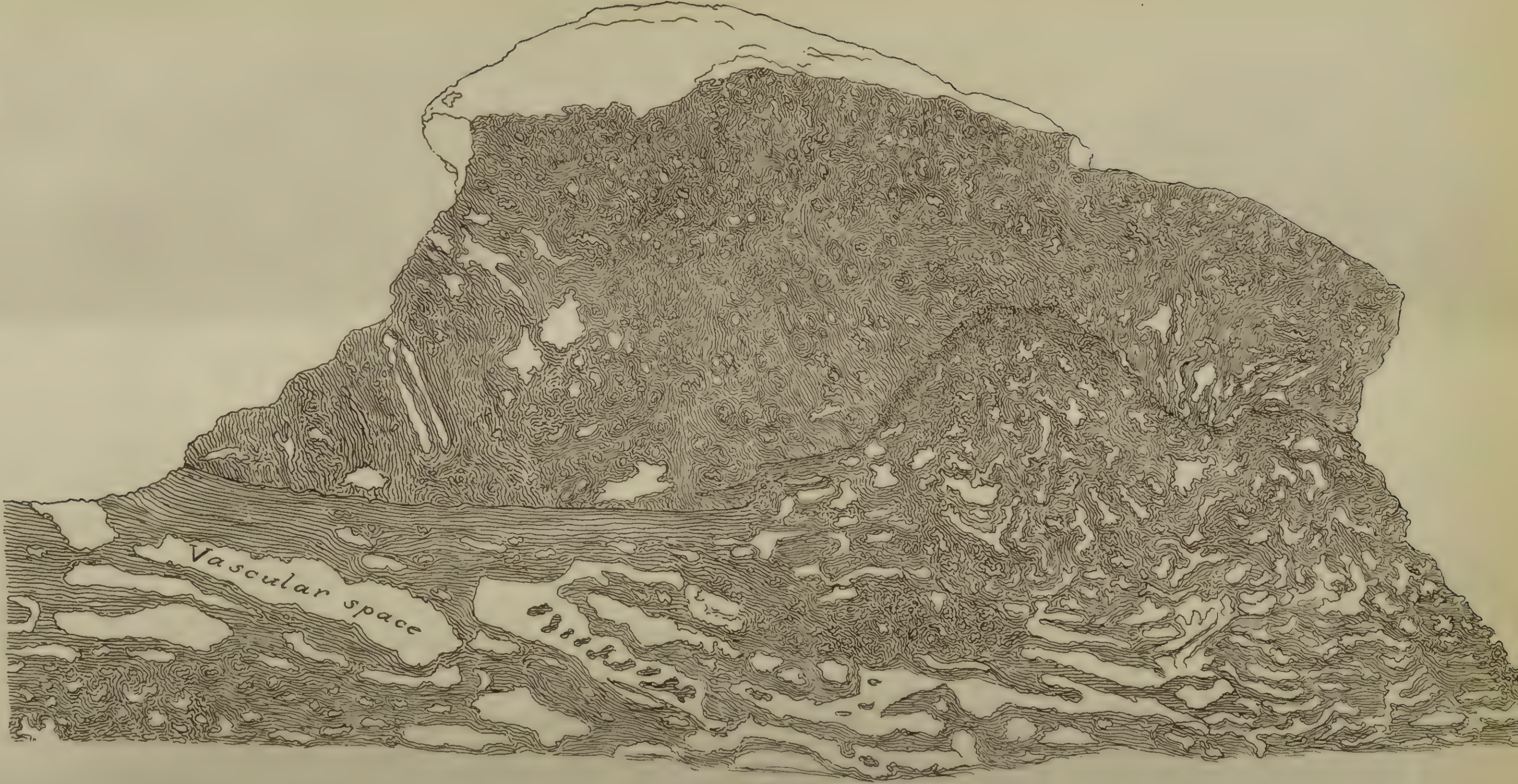


Fig. 115.—Magnified drawing (× 8) of the shaded area shown in Fig. 114, *b*. The osteoma which lies at the top in the drawing is seen to grow out of the boc of the vertebra and grow backward along the bone. The line of demarcation is clearly evident.

and a length of 25 mm. On the right side of the bone the lesion is relatively smooth, with lines of growth running circularly around the body of the mass, interrupted anteriorly by an invading mass of rougher bone. The portion of the right side is quite roughened and raised into a series of irregular ridges. The osteoma is sharply marked off from the body of the vertebra, as may be seen in the sawn section. The osteoma has produced considerable disturbance near the posterior end of the vertebra to which it is attached, and is doubtless an outgrowth from the bone at this place. After the excresence had attained considerable dimensions it began to grow anteriorly under the longitudinal vertebral ligament and merely rested on the bone, as may be seen by referring to Fig. 115. A microscopic study of this lesion has not yet been made. The portion represented in the sawn section (Fig. 115) is indicated in Fig. 114, *b* by the shaded area.

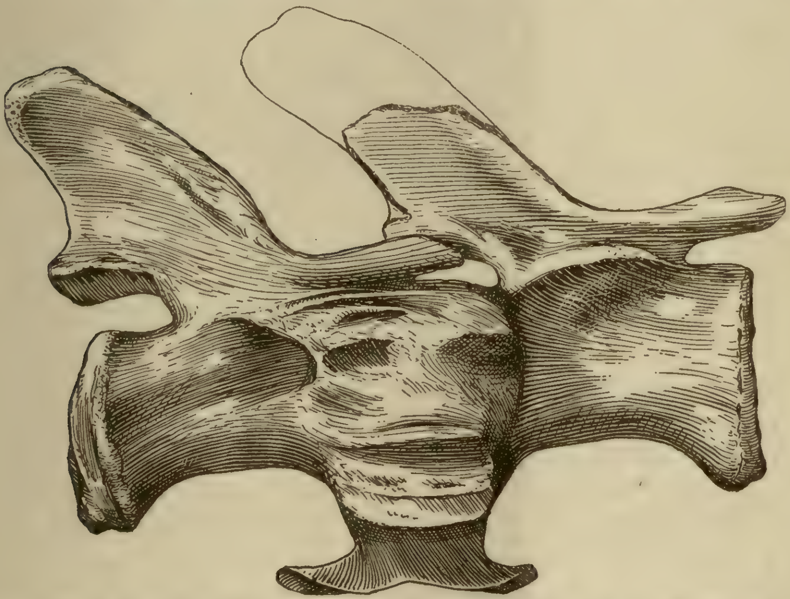


Fig. 116.—Hemangioma between the two caudal vertebræ of a giant dinosaur, from the Comanchian of Wyoming. The lesion has involved all of the articular surfaces of the two bones.

The other arthritic lesion shown (Fig. 116) is from the vertebral column of a dinosaur, *Diplodocus*, from the famous Como beds of Wyoming, to which an age of 18,000,000 years may be assigned. A larger and similar lesion, described elsewhere, seems to be a hemangioma, or it may be a callus due to fracture of the tail, or osteomyelitis or some other infective process. At any rate, it is a type of lesion which is not uncommon in the dinosaurs. These gigantic reptiles, with a length of nearly 70 feet and a weight of approximately 40 tons, dragged their tails along on the ground for a length of nearly 30 feet. The terminal vertebræ were reduced to mere slender rods of bone and were easily subject to traumatism. The real nature of the lesion is not established, but there is no evidence of infective processes. The union of the two vertebræ is a solid one, a true ankylosis.

The above-described lesions are known on the bones of ancient vertebrates. More recent lesions are known on the remains of Pleistocene vertebrates. Pathologic conditions were first recognized and described among the Pleistocene mammals, especially the cave animals of Europe. Rudolph Virchow initiated the study of these lesions in 1875 by the discussion of a case of spondylitis deformans in the vertebræ of a cave bear from Bavaria. The deposits in the caves were the first to be explored by paleontologists, but the remains found in the caves were for a long time thought to be relics of the universal flood, which, according to Hebrew tradition, had destroyed all animal life. Buckland, Dean of Oxford, defended this idea in his Reliquiæ Diluvianæ, and his descriptions and interpretations of the bones are based on this assumption.

Many traumatic conditions are found among these ancient bones. Fractures, caries, absorptive processes similar to pyorrhea alveolaris, necroses, arthritic lesions, often resulting in the complete ankylosis of several vertebræ, osteoperiostitis, and other afflictions are known on the remains of Pleistocene vertebrates.

Associated with the remains of Pleistocene mammals often occur the bones of primitive man. Early man was subject to the same traumatic influences as were the early cave mammals.

Caries, alveolar abscesses, fractures, arthritis deformans, spondylitis deformans, and other diseases are known to have afflicted early man.

Many of the modern diseases which afflict the bones, such as syphilis and tuberculosis, are utterly unknown among fossil animals, since their diagnosis cannot be established on the evidence which is at present available. We have advanced no further into the geologic history of syphilis than was attained when Virchow wrote his paper in 1896 on the "History of Syphilis," in which he called attention to the lesions of the "Höhlengicht" of the cave bears. Syphilis has been suggested as the cause of certain lesions of the remains of early man from Chellean of France, but this statement is unsupported. We may say at present that there is no geologic evidence of the presence of syphilis prior to 500,000 years ago. Doctor Pusey has given sufficient subsequent data to establish all we know about the rise and spread of this dread disease.

Doubtless many of the lesions seen among fossil animals are the lesions produced by an extinct disease. It seems logical that some of the diseases which afflicted ancient animals became extinct with the group which were afflicted. The influence which disease has exerted in the extinction of various groups of animals is of doubtful importance. We are at least safe in asserting that the diseases which afflict the hard parts of animals have not been sufficiently important in the past to produce wide-spread extinction.

The science of paleopathology is yet quite young. We are only beginning a study of the lesions of ancient times. The importance of such a study in the interpretation of modern diseases is undoubtedly great. We may even discover something in regard to the nature of disease. One of the very early indications of disease in geologic time is caused by parasitism, and it may be possible that many of the diseases of ancient times had a parasitic nature. This is not yet established. The chief results of the study of paleopathology to date are to call attention to diseases many millions of years old which, so far as we can see, differ but slightly from the lesions of modern diseases.

CLINIC OF DR. H. M. RICHTER

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HEAD INJURIES: DEMONSTRATION OF 2 CASES

Summary: Patients presenting: (*a*) compound, comminuted, depressed skull fracture; (*b*) cerebral contusion, involving cortical arm center; operations—immediate exploration of all scalp wounds for purposes of diagnosis and treatment essential—fallacy of delaying for the *x*-ray picture; general summary of management of scalp wounds made by blunt force.

December 11, 1917.

We have today two head injury cases. The first man was brought to the Cook County Hospital on November 29, 1917, with a small scalp wound in the right side of his forehead, toward the parietal region. Sutures had been placed before the man entered the hospital. As the patient showed no untoward symptoms, he was regarded as having but a minor injury and so was sent to his ward, and the next morning was *x*-rayed. Owing to the volume of radiographic work done here, the *x*-ray report did not reach the intern until forty-eight hours after the man entered the hospital. When the *x*-ray plate was finally examined, it was found that the patient had a depressed skull fracture underlying his scalp wound.

The second patient came into the hospital forty-eight hours ago, with an abrasion of his forehead. He was sent directly to the observation ward, where it was found that he had paresis of his right arm. Because of his lack of knowledge of English and the difficulty of securing an interpreter the history is quite wanting. We do not know whether the paresis was present from the time of injury or developed later. We do not know, moreover, whether the patient was unconscious for any length of time. It is believed, however, that the paresis came on some hours after the injury was received, and in discussing the diagnosis of the brain lesion we shall take up the importance of this phase of the history.

I wish to call your attention to the fact that both of these patients were under observation for a number of hours before a diagnosis was made and the course of treatment outlined—and I do this with the intention of presenting to you my idea of the proper course of treatment for all early skull injuries as opposed to the method represented in these two instances.

Every scalp wound made by a blunt force presupposes sufficient energy to damage not only the scalp but the underlying bone, and particularly the brain itself. Therefore no scalp wound of this character should be passed by for further study, but the immediate diagnosis should be arrived at as to the extent and nature of the injury.

The examination to determine this diagnosis should proceed as follows: The scalp should be prepared as if for skull operation, the wound immediately disinfected, and the edges of the wound trimmed or excised. In other words, the soiled wound should be converted into a surgical wound. The depths of the wound should be thoroughly explored, and if periosteum remains intact over the bone, it should be incised and pushed back with a periosteotome, and the skull examined for fracture. This routine treatment gives immediate, exact information as to the presence of an underlying skull fracture.

In the absence of such a fracture, the scalp should be sutured and closed without drainage, as if it were a clean hernia incision. This method of routine exploration of the skull in every scalp wound caused by blunt force was customary during my internship in this hospital twenty years ago. *I believe it a most unfortunate development that the x-ray examination has been substituted for this perfect means of immediately establishing the local condition.*

Only where the presence of a foreign body, such as a shell fragment, may determine the line of procedure, should the *x*-ray examination take precedence over direct examination, and here only when the *x*-ray examination can be made at once.

The second step in the examination is the roentgenographic examination made to determine the presence of a fracture at a distance from the scalp wound.

Preliminary to these two steps in the patient's care is, of course, the observation of the patient himself, to determine whether focal or other phenomena are manifested.

The idea, then, is to determine immediately the patient's condition in order that we may be guided in our treatment. We believe it a mistake to permit a patient with a scalp injury to wait many hours for an *x*-ray examination, when his condition can be determined at once. Where emergency *x*-ray work can be done and the results obtained at once, its use is of the greatest auxiliary value.

The further care of the patient will be determined then by the nature of the skull fracture, and the nature of the brain injury. The time of intervention should only be delayed when the nature of the brain injury is such as to make it advisable.

The first patient, presenting a depressed skull fracture underlying a scalp wound, was brought to the hospital soon after the injury. He presented at that time a type of injury calling for immediate treatment without awaiting *x*-ray work. Our treatment here should have consisted of the immediate exploration above described and the elevation of the fragments. If, however, a skull fracture is accompanied by evidence of profound shock or of extensive cerebral laceration, it is far more important to take cognizance of the patient's general condition and avoid immediate operation as one would avoid such an operation in the shock accompanying an extensive crushing injury of the thigh.

In the patient before us, with a skull fracture first discovered at the end of three or four days from the time he was injured, it was felt unsafe to interfere for the purpose of raising the depressed fragments until complete wound healing had occurred, since the scalp wound, sutured before the patient came to the hospital, was apparently not aseptic. Today, however, the wound is clean and we shall proceed to operate.

In the second patient the history of the time of onset of his paresis is unfortunately lacking. He has an abrasion on the left side of his forehead and his left arm shows some degree of paresis which has not varied in the last forty-eight hours. Since it appears that the paresis came on some hours after injury, we think it likely that it must be due to hemorrhage; and since the cerebral lesion must be on the side of the head opposite to the abrasion, it is also apparent that the lesion must be one of the type developed by contrecoup. Injuries occur by contrecoup either in the bony skull, the dura, or the brain substance, but it is obvious that the consistency of the brain substance renders it far more susceptible to this type of injury than either bone or dura. A hemorrhage, therefore, occurring by contrecoup is most likely to be produced by cerebral laceration with injury to the cerebral vessels rather than to the meningeal artery. Since the cortical area involved is apparently rather small, we shall vary from the usual osteoplastic flap method and remove bone from beneath the temporal muscle, as if we were doing an incomplete subtemporal decompression, hoping to find in this way the hematoma with a minimum degree of operative traumatism. We shall now operate upon these patients.

In the first patient we turn down a flap of skin and subcutaneous tissues in such a way as to make the original scalp wound the center of our flap, with the base of our flap directed toward the temporal region, in order to secure for it a good blood-supply. We find the scar adherent to the fractured bone and separate it by sharp dissection. A bony defect, approximately $1\frac{1}{2}$ inches in length by $\frac{1}{2}$ inch in width, becomes apparent. Numerous small fragments present themselves, rather fixed by exudate, depressed and firmly wedged into place over part of the area. The bone is grossly soiled—the dirt evidently ground into the tissues.

The condition of wound healing, I might say, presents a remarkable evidence of nature's ability to care for soiling and prevent active infection from developing.

With a chisel the edges of the depressed fragments are removed to permit the edge of the chisel to gain entrance. The small fragments are then levered out of position. It is found that in most of the fragments the plates are separated, and the soiled, outer plates are thrown away. The clean fragments, particularly those of the inner plate, are saved. A fragment, upward of 1 inch in length and nearly $\frac{1}{2}$ inch wide, is found depressed at right angles to the skull. It is easily levered back into position. The dura is found uninjured. A few of the small fragments of the inner plate are now replaced and the scalp sutured back into position, without drainage.

For the second patient we will make an incision practically the same as used by Cushing for subtemporal decompression.

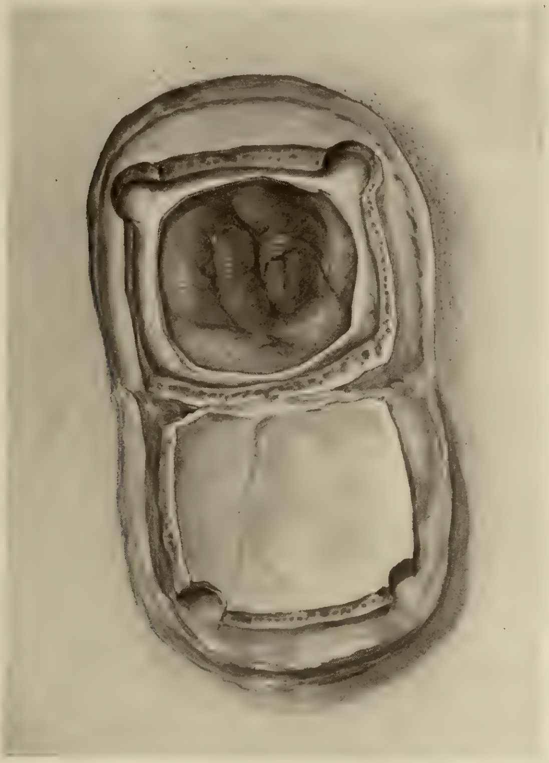

Fig. 117.—Osteoplastic flap turned down in a case presenting a picture of gross cerebral injury similar to that found in Case 2. Shaded area, contusion of brain substance represented by ecchymoses.

It is carried down to the temporal fascia, the flap turned downward, the temporal fascia split, and the upper, thin bone opened with a Hudson drill. The drill proving to be dull, a small trephine is substituted and a button of bone removed. The bone is then widely rongeured away, mainly upward toward the lower end of the motor area, and the dura opened (Fig. 117).

The brain presents the appearance of extensive ecchymosis, with no hematoma to be found. Hemorrhage from a pial vessel that gives considerable annoyance is instantly controlled by placing a shred of temporal muscle upon it and making pressure. The lesion consists in cerebral laceration involving the arm area, rather than a hemorrhage, and the opening is therefore closed without drainage and without further exploration. (A further history of this case, obtained after operation, made it probable that the paresis was existent from the time of injury. This history is strongly suggestive of cerebral laceration rather than hemorrhage, and is in accordance with the ecchymosis found at operation. Both patients made a normal recovery from operation, the patient with the depressed skull fracture being at work within a few weeks of the time of operation. The second patient showed a little additional paresis of the arm immediately following his operation, from which, however, recovery began to manifest itself, and improvement advanced beyond the original degree of paresis during the ensuing week.)

COMMENTS

Neither of these patients showed any evidence of increased intracranial tension. The amount of damage to the brain in neither case has resulted in any extensive hemorrhage or material amount of secondary traumatic edema. There are no changes in the pupillary reactions, the fundi, or the respective reflexes in either case except as regards the paresis of the right arm in the second one. There is no increase of tension of the cerebrospinal fluid, as manifested by spinal puncture or by altered pulse-rate. The cerebrospinal fluid in the first instance was very bloody. In the second instance it was blood-tinged. The significance of the presence or absence of blood in the cerebrospinal fluid in cases of cranial injury is as follows:

Extradural hemorrhage and hemorrhage into brain substance not reaching the pial membranes or the ventricles does not appear in the spinal fluid. Cerebrospinal fluid, under these conditions, remains clear. Thus, an extradural hemorrhage over the middle meningeal artery is not accompanied by blood obtained by spinal puncture. With fractures of the vault, where the dura is not closely adherent to the bone, such an occurrence is frequent.

In fractures of the base, where the dura is intimately adherent to the bone, blood is constantly found in the spinal fluid, as it is in any instance in which blood can reach the meningeal spaces or the ventricles.

SUMMARY

All scalp wounds made by blunt force must be regarded as possibly accompanied by skull fracture or brain injury, or both.

Immediate examination for cerebral symptoms includes a study of the reflexes, the eye-grounds, the cerebrospinal fluid, and of the blood-pressure.

The scalp should immediately be prepared as for a cranial operation, the wound itself disinfected, its edges excised, and the underlying bone exposed and examined for fracture.

No delay should be permitted for *x*-ray examination unless the latter is immediately available.

An exception to this latter rule is the possible presence of foreign bodies, such as shell fragments, the removal of which may be desirable.

The recognition of a compound skull fracture should be followed by immediate operation—which consists in disinfecting the wounds, elevating the fragments, controlling hemorrhage, and closing the wound without drainage.

An exception to this procedure exists in those cases in which shock or excessive brain contusion renders the immediate further traumatism of operation exceptionally dangerous.

It is particularly important that all wounds of a soiled or contused character be at once converted into clean, surgical wounds by thorough excision and immediate closure without drainage.

A delay of a number of hours for observation or *x*-ray examination enables infection to develop in the soiled wound and prevents the immediate closure that is so desirable.

The excision of an extensively contused scalp wound with considerable loss of tissue may make the approximation of the edges difficult, but free incision at a distance from the wound, with sliding of the flap, will obviate such difficulty in most instances, and transpose the denuded area to a site distant from the fracture.

Shell-fragment injuries to skull and brain should be treated by immediate disinfection, excision, and closure, where the condition of the patient permits.

If his condition precludes immediate operation, treatment should be deferred until the patient has been transferred to a base hospital.

Disinfection and closure of the wound without removal of the fragment should be carried out if the latter cannot readily be found.

Persistent coma without evidence of increased intracranial tension does not constitute an indication for operation; nor is it in itself an indication of increased intracranial tension.

Troublesome bleeding from a pial vessel will be controlled by a shred of muscle pressed on the opening in the vessel.

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(Department of Dermatology and Syphilis)

THE EXTRAGENITAL CHANCRE AS A COMPLICATION IN MINOR SURGERY

Summary: Factors which cause delays in diagnosis; the effects of local treatment and of the invasion of pus cocci; importance of the demonstration of the spirochete as an aid to rapid diagnosis; technic; method of obtaining material for examination; the dark-field illuminator.

Fournier, the great French syphilologist, who was accused by his contemporaries of seeing syphilis everywhere, answered his critics by saying, "que l'on ne soñge jamais assez à la syphilis"—we don't have it in mind frequently enough.

This failure on the part of the physician to think of the possibility of syphilis when confronted by lesions on the hands or face which appear to be indolent pus infections of very low-grade virulence results in many chancres going unrecognized until the disease has become generalized and much harm to the patient has been done. Not only does the physician fail in many such cases to recognize the extragenital chancre in his patient, but oftentimes a physician is met with who has failed to consider the possibility of syphilis in a lesion on his own hand. This is especially true among physicians who have a good class of patients in the smaller communities. Such men encounter syphilis so rarely among their patients that they are caught off their guard and become infected without suspecting it.

One of the famous medical teachers of former days at Rush Medical College is still quoted to the effect that when examining a patient the examiner should put his finger into every hole he can find. This is, of course, good advice considered from the standpoint of thoroughness in examination, but following out this advice is sometimes very hard on the fingers, and particularly was this true in the days of the prerubber-glove dark ages. Many infections have resulted from palpation of mucous membrane lesions by the ungloved index-finger and also from doing obstetric and gynecologic work without gloves. But in some cases infections have occurred in spite of rubber gloves. Either the rubber may become torn accidentally or, as in 2 cases (Fig. 118), which I have seen in my work with Dr. Oliver S. Ormsby, the spirochete has found a portal of entry on the wrist above the line of the glove.

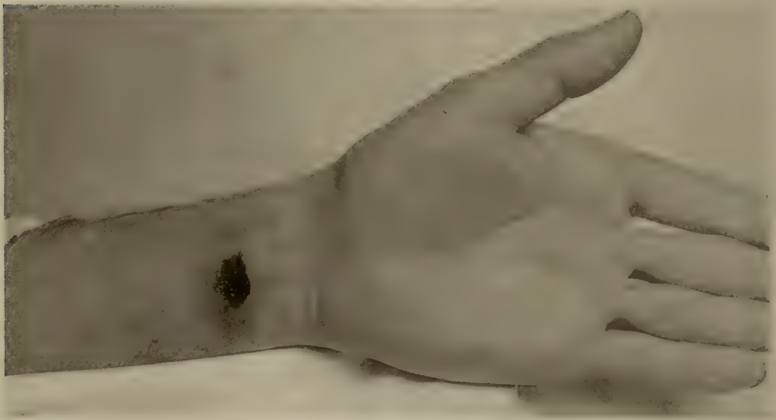


Fig. 118.—Chancre developing near the top of the rubber glove on the wrist of a left-handed physician.

The lesion shown in Fig. 118 occurred on the left wrist of a physician who enjoys a large practice in a wealthy community. It began as a small papule and for some time was given no attention. It continued to enlarge, however, and became painful, and was associated with lymphangitis and axillary lymphadenitis. The physician then commenced to treat it as a pus infection, with hot dressings and an attempt at drainage. The lesion not only showed no evidence of healing, but gradually increased in size. After about eight weeks he noticed a feeling of malaise, anorexia, and loss of weight. Joint pains developed and the patient became so ill that he was scarcely able to carry on his practice. Not until then did he begin to think of syphilis, but even after going over his records he was unable to find any case in which he could recall any possibility of infection. Later, however, he remembered having delivered a woman whose husband, unknown to him at the time, had syphilis. When he presented himself for examination twelve weeks after the onset of the lesion he was found to have a generalized maculo-papulo-exanthem, a positive Wassermann, and numerous Spirochætæ pallidæ in the chancre. The disease was transmitted to the wife, in whom it ran a similar course, except that treatment was instituted much earlier and the Wassermann became negative in a much shorter time.

This case serves to demonstrate the unfortunate sequelæ which attend the treatment of a chancre as a pus infection. Had this physician presented himself for examination in the first week after the appearance of the papule, the spirochetes could have been found, intensive treatment administered, the development of secondary manifestations and also the contamination of the wife could have been prevented.

The other wrist case occurred just above the glove line on the right wrist in a physician who comes in contact with syphilis quite frequently. He has always been on his guard and perhaps might be thought by some to be overcautious. When the papules appeared on his wrist he did not believe it to be a chancre for the very reason that he had always taken elaborate precautions to avoid contagion. At first he thought it a pus infection and treated it as such. It did not yield to hot dressings and incision, however, and he began to think of blastomycosis and actinomycosis. When finally he appeared for examination, about six weeks after the onset, he had decided that it must be anthrax. Ten minutes sufficed to demonstrate spirochetes with the dark field, and on the following day the Wassermann proved to be positive.

Another interesting case occurred in a young surgical intern in one of the large hospitals. The lesion began on the finger as a rather acute pus infection. Lymphangitis developed and the arm became swollen. In spite of careful surgical treatment with hot packs and free incision the lesion continued to enlarge. Finally the lesion was excised, cultures were made, and the tissue examined histologically. A number of highly skilled men agreed that it was an obstinate pus infection. No attempt, however, was made to find the spirochete. In due course of time secondary manifestations of syphilis developed and the patient was put upon treatment. The association of pus organisms with the spirochetes in the production of this lesion so masked its clinical appearance that the surgeons who had the case in charge were completely deceived. It is fairly certain, however, that spirochetes could have been demonstrated during the first week after the onset.

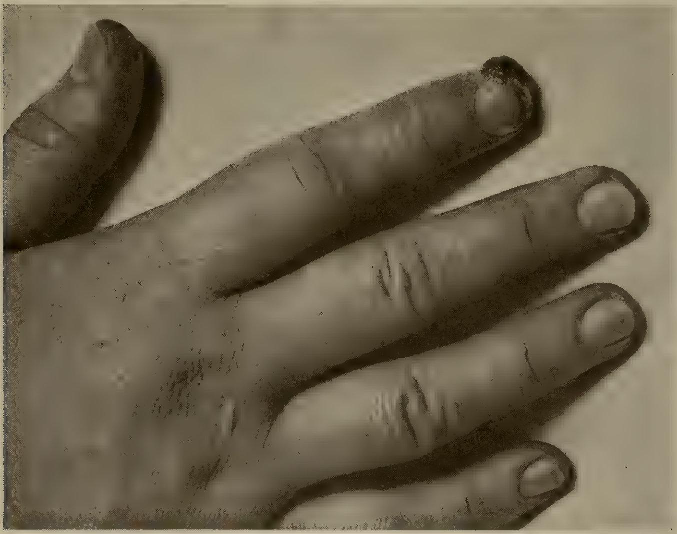


Fig. 119.—A chancre on the tip of the index-finger of a nurse, showing the soft granulation-tissue-like appearance.

The clinical appearance of the chancre has been so frequently described for so many years that almost every medical man has memorized the description, and if the appearance of the lesion does not fit this description, the possibility of its being syphilis is sometimes dismissed. There are many factors at work oftentimes, however, to interfere with the pathologic processes, and as a consequence the clinical appearance of the lesion is atypical. Chief among these are: (1) The location of the lesion; (2) the association of the pus cocci; (3) the treatment.

If the lesion develops in a region where it is constantly traumatized, as on the tip of the finger (Fig. 119), it may present an appearance which is quite different from that of a chancre on the eyebrow (Fig. 120), where it could develop with relatively little interference. Or if the infection take place on the lip, particularly on the lower lip, there is not only opportunity for constant trauma, but maceration and secondary infection as well. As a result the lip chancres are usually quite large, rather boggy, and exude a large amount of serosanguinolent fluid which dries into a thick crust. This crust is torn away from time to time and a new one is built up.

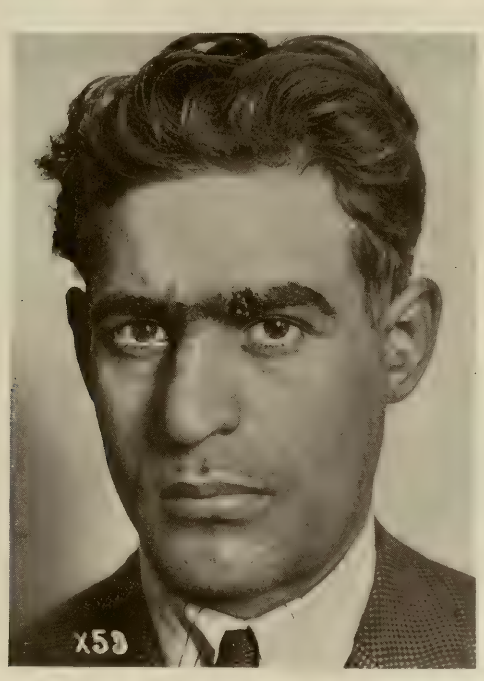


Fig. 120.—Photograph showing a chancre on the eyebrow and submaxillary adenopathy on the same side.

The effect of surgical treatment of a lesion on the finger is well shown in Fig. 119. This primary formed on the index-finger of a nurse who was actively engaged in her work. The combined action of having her hands frequently in water, the manipulation by the patient in an attempt to evacuate pus, and later the hot dressings and incising and trimming done by the attending physician so altered the appearance and the induration that without a search for spirochetes no one would have been able to make a positive diagnosis. The lesion consisted of a rounded mass, was soft and readily oozed serous fluid. The edges had been pared away under the supposition that the tissue was unhealthy granulations. Spirochetes were unusually numerous and the Wassermann was already positive when the patient was first seen five or six weeks after the appearance of the primary papule.

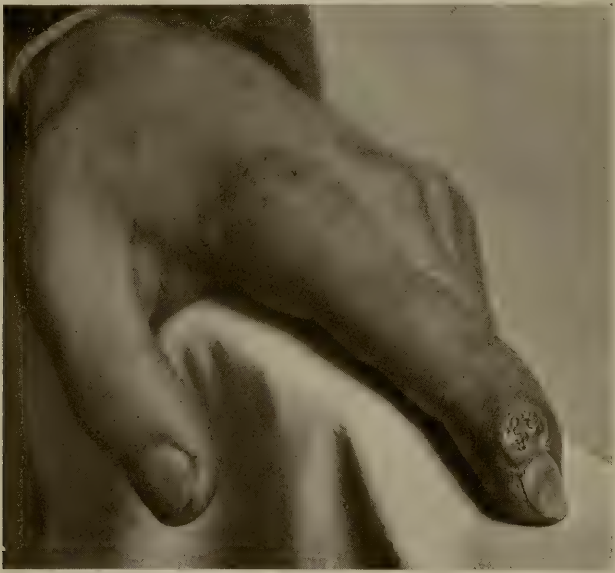


Fig. 121.—A chancre on the left index-finger following contact with vaginal lesion.

The history as given by the patient may lead the busy practitioner far astray even though there be no intention on the part of the patient to deceive him. A good example of this is shown in the next case (Fig. 121). This chancre appeared on the left index-finger of a young man employed in a large plant. When he reported to the company physician he stated that he had pinched his finger in a door, a statement which was perfectly true. The physician glanced at the finger and instructed the nurse to dress it daily. The instructions were carried out, but inasmuch as the lesion had not healed after several weeks, the physician suspected syphilis and referred him to the writer.

When I examined him he volunteered at once the information that he had had the lesion for four weeks and that it followed an abrasion resulting from catching the finger in a door. The ulcer looked like a chancre, however, and without further delay serum was collected for examination. After finding the spirochetes I returned to him and questioned him closely. At first he stoutly denied that he had been exposed to infection, but later he recalled that while in a small town he had made the acquaintance of a girl at church on Sunday evening, and that while in the hammock he had made a vaginal examination. "But that was a long time ago," he said. This "long time ago" proved to be seven weeks, which was just right, allowing three weeks for incubation and four weeks for the duration of the chancre.

Occasionally one encounters a case in which the surgical treatment has taken the form of complete excision. For many years there had been much discussion of the advisability of this procedure, but gradually the practice became abandoned, for the reason that no clinical benefit could be observed. Recently this has again been advocated, especially by Wile, of the University of Michigan. Excision of the chancre, however, always presupposes simultaneous, intensive, antisyphilitic treatment, and no one anticipates any clinical results from excision alone. When an extragenital lesion is excised, through a mistake in diagnosis, then great harm is done to the patient, because valuable time is lost. The following description of a case serves well to illustrate this point:

A young and vigorous married man, who was in one of the training camps for army officers, developed a lesion on the abdomen near the umbilicus. His civilian physician treated it for a time as a boil, but the lesion continued to enlarge. Finally, he made a complete and wide excision of the tissue, which he sent to a commercial laboratory for diagnosis. In a lengthy report submitted by this laboratory, blastomycosis, tuberculosis, anthrax, and leprosy were excluded from the possibilities, and by a process of elimination a definite diagnosis of an acute pus infection was made. Syphilis, unfortunately, was not even considered—at least it was not mentioned in the report. The wound healed without difficulty and left a scar 6 inches long. About two months later the patient developed lenticular papules on the face and corymbose papules on the trunk. His physician then began to treat him for acne vulgaris, mistaking the lenticular papules for ordinary acne. Not until an interstitial keratitis and pharyngeal mucous patches incapacitated him for military duty was a diagnosis made by his medical officer, who recognized the nature of the disease at a glance. He was referred to Dr. Ormsby for treatment and later was discharged from the camp.

If, in this case, an examination for spirochetes had been made in the first week after the onset of the trouble, intensive treatment would have healed the lesion within five days, the man would have been spared the discomfort of the secondary lesions, he could have continued his military career, and in all probability the Wassermann reaction never would have become positive.

Another interesting phase of the extragenital lesion is the development of a chancre as a direct result of a minor surgical operation. We have now under treatment a woman who while sewing ran a needle into her hand. She hastened to a nearby physician, who was known to be a hard drinker and to be very careless about aseptic precautions. The patient found him somewhat intoxicated, but feeling that haste was imperative, allowed him to probe for the needle with an instrument which was visibly contaminated. At the point of probing a chancre developed.

Another case which was the indirect result of a surgical operation was recently referred to us by an excellent surgeon who had operated upon a young man of nineteen for a bilateral inguinal hernia. Several stitch abscesses occurred on the right side, but all healed uneventfully. One abscess, at the lower end of the scar, the last which had occurred, had given the patient trouble for some weeks, but, notwithstanding, he did not return to the surgeon for treatment. He finally fell into the hands of a physician who recognized the chancre which had developed (Fig. 122) and who tried to persuade the boy that he had grounds for legal action against the surgeon. The boy readily admitted, when questioned, that while these stitch abscesses were still open ulcers he had cohabited for a period of three weeks with a young woman who had warned him that she had syphilis and who had cutaneous and mucous membrane lesions at the time he formed the liaison.

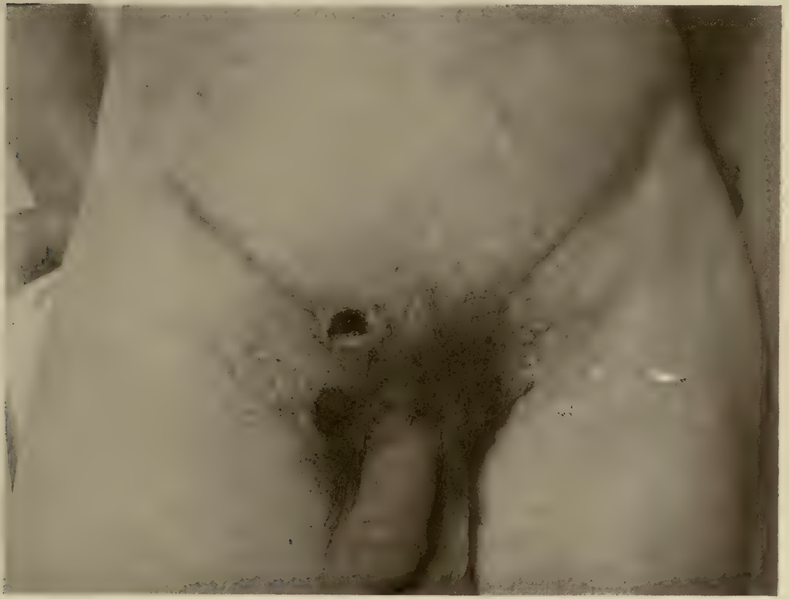


Fig. 122.—Chancre which developed in a stitch abscess of a herniotomy scar.

The significance of this group of extragenital chancres lies in the fact that the extragenital lesion is very common—probably at least 10 per cent. of all cases—and that many cases are treated as pus infections which instead should be examined immediately for spirochetes. Any indurated papule which persists for more than a week should excite suspicion on the part of the physician.

After the lesion has developed to the point where it has become a crusted nodule with cartilaginous induration and marked regional adenopathy the diagnosis is readily made, but by this time the patient has acquired a generalized distribution of spirochetes and the treatment has become correspondingly difficult. The time to save the patient from all the unfortunate sequelæ of a luetic infection is during the first week, and the only way this can be accomplished is by making thorough and, if necessary, repeated examinations for spirochetes. The Wassermann will be of no aid in the diagnosis at this time, because it rarely becomes positive within less than three weeks after the beginning of the chancre.

A point that is of the greatest importance in the treatment of a suspected chancre is the *avoidance of cauterization and the avoidance of the use of local mercurial applications.* The reason for this is that no possible good can be done by such treatment alone if the lesion prove to be a chancre, and, furthermore, the demonstration of the spirochetes is thereby rendered very difficult or impossible.

The two important steps in the *demonstration of the spirochetes* are the collection of the serum and the setting up of the apparatus. If the lesion be not more than a week old the serum which exudes from the surface should be drawn up in a Wright pipet, which is nothing more than a glass tube drawn out to a point, or the serum may be taken up on the point of a dull blade, and then placed on a thoroughly clean slide. Enough serum should be obtained so that when the cover-slip is placed over it there will be no bubbles left. If the lesion be more than a week old it is sometimes necessary to puncture the base of the indurated lesion with a very fine hypodermic needle and aspirate the serum by means of a Luer syringe which has an air-tight plunger.

After placing the cover-slip over this drop of serum it is well to rim the cover-slip with balsam or melted paraffin. This procedure is for the purpose of holding the slip in place and of preventing infection of the operator.

The light used should be the strongest possible, and the best is a small arc light. The dark-field illuminator is nothing more than a microscope stage which has a large perforation and in the center of which is a black disk. About this perforation is a beveled mirror. Therefore no light comes up directly through the aperture in the stage, but instead it strikes the beveled mirrors and is thrown directly across the microscopic field. The result is a bright illumination of all the particles in the serum against a black background. If the field be brightly lighted it means that too much light is entering through the objective. In order to cut down this light it is then necessary to insert a conical condenser, which fits in the Bausch & Lomb immersion lens. With a little skill and the proper apparatus (Fig. 123) the demonstration of the spirochetes becomes a very simple piece of technic.

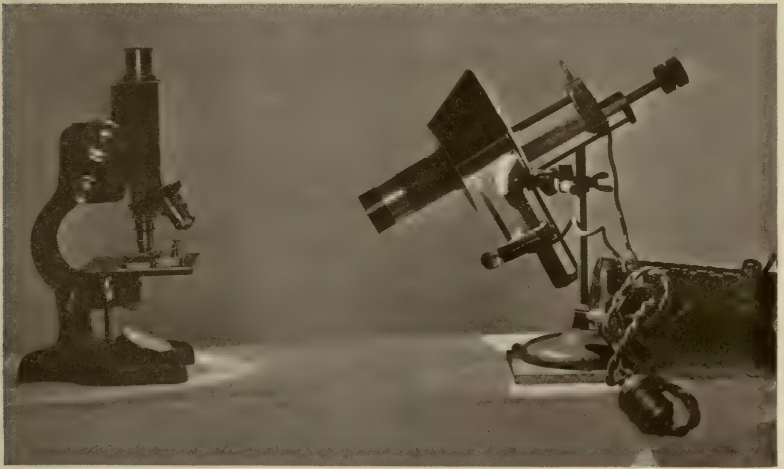


Fig. 123.—Apparatus in position for detection of Spirochæta pallida. Note that the Abbé condenser has been swung aside.

In the absence of apparatus the physician in the small town may collect the serum himself in a Wright pipet, seal the ends, and send it to a laboratory which is properly equipped for making such examinations. Transportation of the serum will result in loss of motility of the spirochetes, but the morphology will be retained for a few days or even as long as a week in some cases.

CLINIC OF DR. THOMAS J. WATKINS

ST. LUKE'S HOSPITAL

PALPATION OF KIDNEYS: TECHNIC AND DIAGNOSTIC IMPORTANCE

THIS subject is discussed because my experience is that ability to palpate the kidneys has not been generally acquired by physicians. This opinion is based upon the literature and personal experience. Both kidneys are palpable in women in 95 per cent. or more of cases. If one is not able to palpate the kidneys in some such percentage of cases, it is proof that his technic is deficient, or his sense of touch not sufficiently developed.

Technic.—The principle involved in the technic is much the same as has been developed in conjoined palpation of the uterus and ovaries. This palpation is so well understood that it probably needs no special discussion.

There are certain features that are highly important in obtaining desirable results. The muscles of the hands and arms should be in a relative state of relaxation; palpation should be done by light pressure; attention should be acutely centered upon the fingers. The sense of touch is much more acute with light than heavy pressure. This can be easily demonstrated by palpating very fine objects, such as needles, threads, and the like. Firm pressure also has the disadvantage of stimulating the muscles to contract and thus to increase the resistance to palpation.

I am informed that palpation is very much facilitated by placing the patient in a warm bath, but I have had no personal experience with this.

The hands are placed, as in palpating the uterus and ovaries, so that the organ is engaged between them. One hand is held quiet, while the other makes light vibratory motions. There is no special choice as to whether the hand posterior to the kidney or the one in front is held still. There may be slight advantage in the hand anterior to the kidney making the vibratory motion. The hand anteriorly should be shifted upward and downward so as to obtain the lower boundary of the kidney. When this hand is below the lower border of the kidney then no impulse is obtained on the other hand. In cases of uncertainty as to impulse, this uncertainty can often be removed by comparing the sensations obtained when the anterior hand is over the usual location of the kidney with the sensation obtained when this hand is placed a good distance beyond the border of the kidney.

Complications Which May be Encountered.—On the right side a distended gall-bladder may cause an error by its becoming engaged with the kidney between the two hands. This can usually be excluded by shifting the hand which is anterior, and with a large gall-bladder one can generally get the impulse of the kidney to the side of the enlarged gall-bladder.

Another complication which may interfere with examination is a long lobe of the liver extending down over the kidney, which is easily mistaken for a kidney, and in some cases, I believe, can only be excluded by auscultatory percussion. The question of auscultatory percussion, however, will not be considered here, as it is aside from our subject.

The presence of tumors may also be misleading, but tumors in this region are so uncommon that they are not of great importance. On the left side the presence of an enlarged spleen may be mistaken for the left kidney. This, however, is not a common occurrence, and can also be easily excluded by auscultatory percussion. The presence of a neoplasm over the left kidney may also cause an error, but these are comparatively infrequent.

This means of palpation of the kidneys should enable one to determine the location, the amount of mobility, the size, and the sensitiveness of the kidney. The sensitiveness of the kidney is especially important in cases of pyelitis, and is often a valuable aid in differential diagnosis, especially in the puerperal woman.

There is the same danger of making an error in the size of the kidney as there is in pelvic palpation in wrongly estimating the thickness of the abdominal wall. In both instances, with a thickened abdominal wall, there is always a tendency to overestimate the size of the organ being palpated, and the reverse in cases of a very thin abdominal wall.

The usual method of examining kidneys, by forcing them to slip between the fingers, is valuable, but it is too crude to be of much use, as in a majority of cases this is not obtainable, and is never obtainable on the left side unless the kidney is very much enlarged or greatly displaced.

CLINIC OF DR. PAUL OLIVER

Cook County Hospital

A CASE OF HODGKIN'S DISEASE

Summary: A patient presenting progressive right cervical lymphadenopathy of five months' duration; diagnosis of Hodgkin's disease—the differentiation of tuberculosis, lues, chronic coccal lymphadenitis, leukemia, lymphosarcoma, and metastatic carcinoma; treatment.

This patient, a clerk, thirty-two years old, enters the hospital because of a swelling on the right side of the neck.

Five months ago he noticed a nodule about the size of a marble just below the angle of the jaw. It was soft and painless, and grew gradually. Other nodules later began to develop in this region. There has never been any pain, tenderness, or fever. He has not lost in weight or strength and has worked up to the time of coming to the hospital. Has never had any sore throat or toothache. His family and marital histories are negative.

He denies gonorrhea and syphilis. He is a moderate drinker and uses tobacco to excess.

On examination we note that he is of robust appearance and apparently in good health except for a prominent swelling of the right side of the neck. This swelling extends from the lobe of the ear to the clavicle and from the anterior margin of the right trapezius to within an inch of the midline anteriorly. It is most prominent at the upper part. The skin appears normal over it. To palpation, the superior part, occupying the submaxillary triangle, is a firm, lobulated mass—not tender. Toward the clavicle discrete, firm, ovoid nodules, varying in size from that of a pea to an olive, can be made out. The large superior mass is about the size of a goose egg. The skin is freely movable and the entire mass is quite freely movable on the underlying structures. The nodules, for the most part, are freely movable one from the other. No fluctuation can be made out. This lesion is a chronic process involving the lymphatic glands of this side of the neck. A differential diagnosis involves consideration of tuberculosis, lues, chronic coccal lymphadenitis, leukemia, lymphosarcoma, Hodgkin's disease, and possibly metastatic carcinoma. Further clinical and laboratory findings will serve to differentiate.

Examination of the mouth shows the teeth in good shape. The pharynx is injected and the tonsils visible, but apparently otherwise normal. No ulcer is visible. The lymph-nodes of the left side of the neck are barely palpable. Palpable glands are present in the right axilla, none in the left. The inguinal nodes are palpable, but not larger than is usual in adults. The lung findings are negative, as is percussion of the mediastinum. *x*-Ray examinations of the lungs and mediastinum are negative. Palpation of the abdomen reveals a spleen which can be distinctly felt, with a hard sharp margin descending on inspiration three fingers below the costal margin. Further examination is negative.

If this were a tuberculous process of the usual type we would expect at this date to find its different stages, namely, caseation and breaking down with fluctuation and fistula formation, in the upper glands. There would also be more peri-adenitis resulting in matting together as well as involvement of the skin and underlying tissues. The absence of another demonstrable tuberculous focus in the body or rise of temperature, and the enlarged spleen also speak against tuberculosis. It is possible, however, for the rarer hyperplastic type of tuberculosis to give such a picture.

This is evidently not lues, because of the negative history and Wassermann. Such involvement would be secondary to a sore in the mouth, most usually the primary lesion, which is not present.

If this were due to a common pus organism, but one or two glands would be involved with some of the signs of inflammation present.

Lymphosarcoma is of more rapid growth and very early infiltrates the tissues of the neck and skin. Pain would also be present after five months' duration and the general health of the patient affected. We would expect to find a hard, immovable mass instead of soft discrete glands.

Carcinoma can be eliminated because of the lack of a primary growth, but more particularly because of the character of the glandular enlargement. In carcinoma only one or two glands are involved as a rule, which are hard, round, and of small size. The age of this patient would also be against such a diagnosis, but it is well known that nasopharyngeal carcinoma is liable to occur in young adults and escape detection, the first indication being the metastatic involvement of the cervical lymph-nodes. This might well be a case of lymphatic leukemia. The blood count, however, excludes such a possibility. The white cell count shows 10,600, with 87 per cent. polymorphonuclears, 8 per cent. small mononuclears, 9 per cent. large mononuclears, and 4 per cent. transitional cells.

Hodgkin's disease remains for consideration. The extensive involvement of the cervical glands, which have remained discrete, with the enlarged spleen, blood findings, and other features of the case fit in well with Hodgkin's disease. Some days ago we excised a gland from the lower end of the chain just above the clavicle. Cultures were made, with negative result. The pathologist's report of the sections state that there is marked thickening of the capsule, marked fibrosis of the gland stroma, a few multinucleated giant cells, many eosinophils. There are many areas of necrosis, and round cells and phagocytic infiltrating cells.

Until recently several pathologic conditions have been confused with Hodgkin's disease—principally tuberculosis and lymphosarcoma. At present it is recognized by most clinicians as an entity. A number of years ago the microscopic picture of the gland section was described by Dorothy Reed and others, and is recognized as distinctive. The typical gland structure is lost. Marked sclerosis of the trabeculæ, thickening of the capsule, epithelioid giant cells, swollen endothelioid cells, and many eosinophils are the main features.

A few years ago Bunting and Yates described a diphtheroid organism cultured from the glands. It was a non-acid-fast bacillus which produced, when injected into monkeys, lymphatic changes analogous to those of Hodgkin's disease. Rosenow isolated a similar organism from which he made a vaccine which was used in the treatment of cases with apparently beneficial results, although riper experience has failed to confirm them. The Bunting organism is thought by some to be an accidental finding, for it has been isolated in a variety of gland enlargements, notably in leukemic glands. It has been suggested that it is a modified form of the tubercle bacillus.

Bunting claims that the blood-picture is distinctive and of diagnostic importance. A moderate leukocytosis with increase of blood-plates and an increase of transitional cells are the principal early features.

Bunting and Yates advised early radical excision of the glands, followed by *x*-ray and vaccine treatment. It is my intention tonight to excise the large pocket of glands in the submaxillary triangle.

A transverse incision is made under the shadow of the mandible. By blunt dissection, principally, the glands, packed closely together and flattened where they impinge, are removed and the wound closed with interrupted silk sutures, leaving a strip of gutta-percha for drainage. Upon incising one of these glands you notice that the cut surface is pinkish gray. The capsule and trabeculæ are markedly thickened, the latter dividing the parenchyma into lobulated areas which stand out above the cut surface. Several pinhead yellow areas are seen. The parenchyma resembles tumor tissue.

There can be little doubt that we have here a case of Hodgkin's disease. The treatment will be carried out with *x*-ray and arsenic.

METASTATIC SARCOMA OF LUNG WITH HYPERTROPHIC PULMONARY OSTEO-ARTHROPATHY

Summary: A patient complaining of the sudden onset of pain in the wrists, hands, and knees coincident with the appearance of cough, pain in the chest, and dyspnea one year after amputation of leg for sarcoma; the diagnosis; possible importance of congenital syphilis in the etiology of hypertrophic pulmonary osteo-arthropathy.

This young man, twenty-eight years old, a Lithuanian, entered our service October 27, 1917, complaining of pain in the side, cough, and difficulty in breathing. The pain is low in the left chest and increased on taking a deep breath. The cough is paroxysmal and brings up a small amount of pure blood with frothy mucus, never any pus.

Onset.—Two months ago he first noted pain in the upper part of the left chest with some dyspnea. After two weeks he consulted a physician, who aspirated about a dram of bloody fluid from the chest. Coincident with the beginning of chest symptoms the wrist, hands, and knees became painful and so sensitive to motion that he could not use them. This condition, although not so marked now as formerly, has persisted. During the past six weeks there has been occasional spitting of blood.

Past History.—During February, 1916, he first noticed pain and swelling just above the left knee. In two months' time the pain became so severe that he had to give up work as a machinist. The pain was greatly aggravated by use of the leg. It was often worse at night and in the morning, being alleviated somewhat by moderate use.

To obtain relief he entered this hospital May 30, 1916. Examination at that time showed the patient to be well-developed and apparently in good health. He walked with a slight limp, favoring the right leg. There was present a generalized lymphadenopathy.

There was present a rather indefinite swelling involving the right femur just above the knee-joint. There was tenderness over the most prominent part, but no fluid in the joint, stiffness, or other signs of acute inflammation.

The lungs and further physical examination were negative. x-Ray plates of the femur showed a very marked periosteal thickening on the outer and posterior part of the femur just above the knee-joint, suggesting a tumor. The roentgenologist stated further that changes in other portions of the shaft suggested osteomyelitis, and stated that the whole picture showed some resemblance to a luetic process. x-Ray plates of the chest were negative.

A diagnosis of periosteal sarcoma was made and the patient advised to submit to amputation. This was refused and he left the hospital.

The tumor continuing to grow, the patient, three and a half months later, entered another hospital, where, on September [illegible], 1916, amputation was performed at the middle of the thigh and the inguinal glands of the right side removed. Following the amputation he was able to do light work as a janitor's helper until the onset of his present trouble.

He denies other illness and venereal infection. His family history is negative.

Examination.—You note that this young man is well muscled, that he lies on his left side, and seems to be distressed greatly by paroxysms of coughing. There is some cyanosis apparent and dyspnea is quite marked. He gives the general appearance of being quite ill. The scanty sputum raised is bloody. Examination of the chest shows limitation of motion on the left side. There is flatness to percussion on the left side of the chest posteriorly from the spine of the scapula down, and in front from the level of the nipple down. The right chest is hyperresonant. Tactile fremitus is absent on the left; present on the right. Breath sounds are very faint over the flat area. Crepitant râles are heard at the level of the fourth rib and coarse râles lower down. Heart dulness extends one finger to the right of the sternum. A superficial scar 2 inches in diameter, which the patient says resulted from a sore during childhood, is present over the upper part of the sternum.

The abdomen is negative.

There is general glandular adenopathy of moderate degree, the largest glands being in the left groin; they are about the size of lima beans.

The right leg has been amputated at the middle of the thigh, and a vertical scar present in Scarpa's triangle indicates that the regional glands were removed.

The ends of the fingers show marked clubbing and some cyanosis. The end phalanges of the toes are of similar shape, although not so marked. The nails are curved over the ends. Marked thickening of the lower ends of the ulnæ can be felt, as well as definite thickening of the inner malleoli. There is tenderness of the metacarpal and metatarsal bones and of the bones about the wrists and ankles.

Further examination is negative. The teeth do not suggest congenital lues.

The left chest has been aspirated and about 2 drams of bloody fluid obtained. This contained cellular débris, connective-tissue cells, fat-droplets, and no bacteria. On examination of the sputum many red blood-cells, a few leukocytes, and many bacteria, but no acid-fast bacilli were found.

The blood count showed 8200 leukocytes.

The urine contained a moderate amount of albumin.

The temperature has been normal since he entered the hospital a week ago.

We have the plates of the original growth taken in May, 1916. You will note the indefinite bony shadow growing from the lower and outer part of the shaft of the femur; the structure of the latter apparently intact. The outer margin of the growth has a "furred" appearance. This was most probably an osteosarcoma of periosteal origin.

During the past week *x*-ray plates of the chest and practically the entire bony skeleton have been made. In the chest plate you can see the mottled appearance of both lungs and the dense shadow occupying the lower left chest (Fig. 124). The dense rounded shadows through the lungs vary from 2 to 6 cm. in diameter and probably represent metastatic sarcoma nodules. The plates of the bones show areas of marked periosteal thickening. The end phalanges of the fingers appear larger than usual. Along the lower third of each ulna is the most striking new growth of bone. There is a dense periosteal growth about $\frac{1}{8}$ inch in thickness, outside of which is a "furry" newer bone deposit (Fig. 125). The tibiæ show similar new periosteal bone growth.

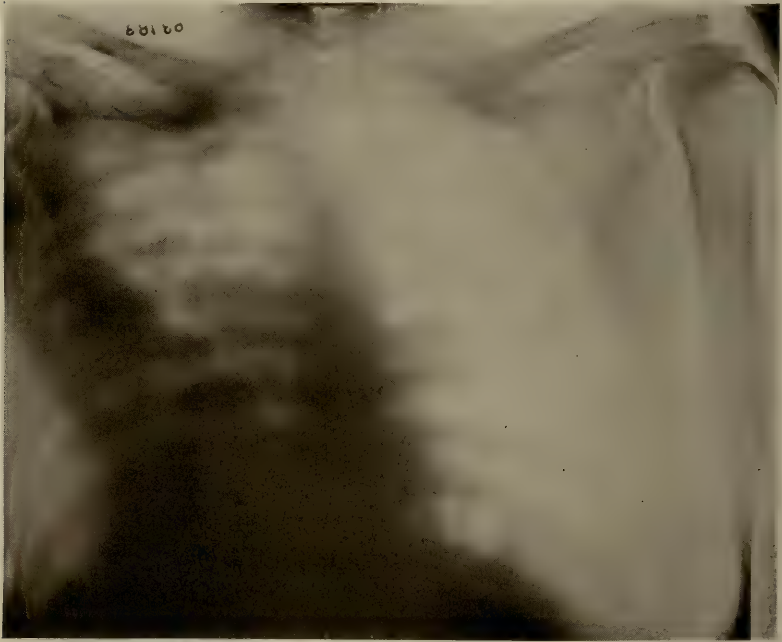


Fig. 124.—Roentgenogram of chest. The sarcoma nodules appear as circular shadows; they are particularly prominent in the part of the picture showing the left lower chest.

Along the first and fifth metacarpal bones is seen a rough new deposition of bone. The femora (Figs. 126, 127) and humeri show periosteal thickening of lesser degree. The skull and spine appear also to be thickened.

We have to deal with a condition which has resulted in new periosteal bone formation of a large number of the bones, especially those of the extremities. It is further marked by "clubbing" of the fingers and toes, and by an acute onset with pain, swelling, and disability, coincident with marked respiratory embarrassment. Although the patient gives no history of chills or fever, the periosteal symptoms are definitely those of an inflammatory process.

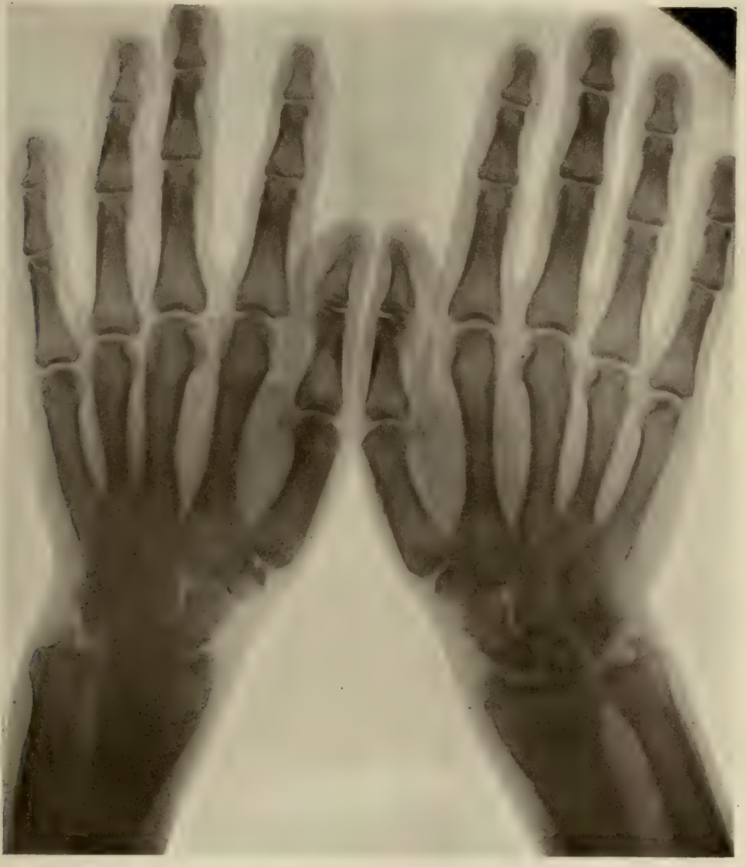
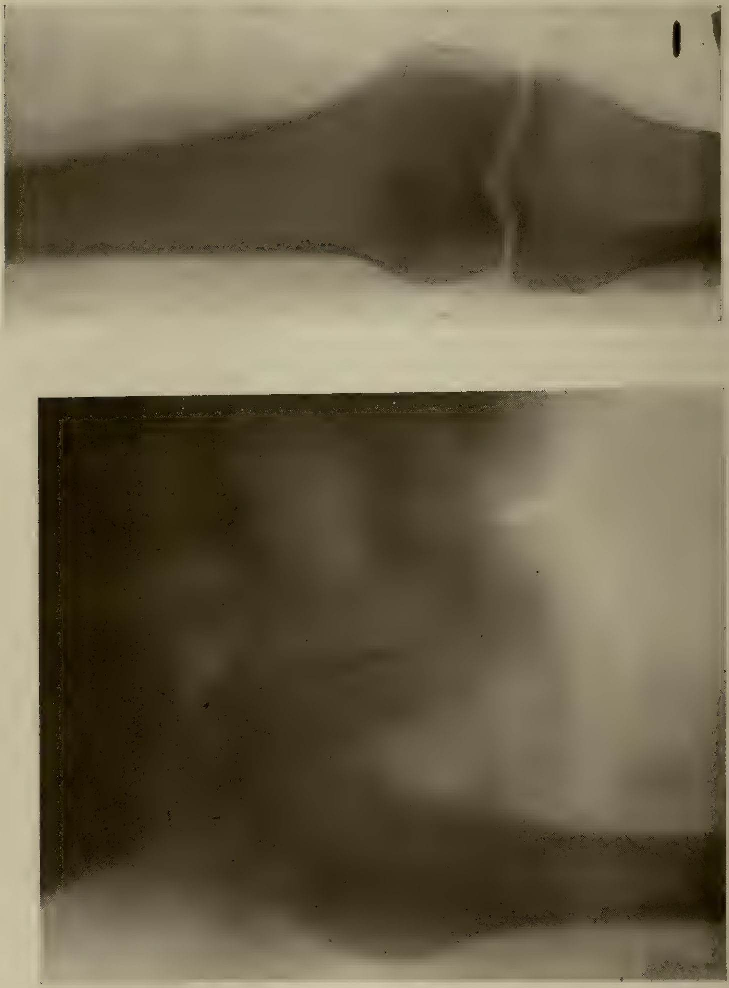


Fig. 125.—Roentgenograms illustrating the wide distribution of the periosteal changes.

Although Bamberger was the first to call attention to this condition, Marie studied it more carefully, and gave to it the name of hypertrophic pulmonary osteo-arthropathy. Our case has the main features considered characteristic, namely, "clubbing" of the fingers and painful ossifying periostitis of acute onset. There are no joint changes and, according to Barker, the usual case shows none. It has been suggested that a more appropriate name might be toxicogenic osteoperiositis. The large



Figs. 126 and 127.—Roentgenograms illustrating the wide distribution of the periosteal changes.

majority of cases are secondary to chronic suppurative conditions of the lung. (See Phemister: "Chronic Lung Abscess with Hypertrophic Osteo-arthropathy," THE SURGICAL CLINICS OF CHICAGO, April, 1917.) A few cases have been reported following carcinoma and sarcoma of the lung. Suppurative conditions of the urinary tract and chronic jaundice are likewise said to produce it. The principal interest attaches to the etiology of the productive periostitis, which is at present unknown. Clubbing of the fingers always accompanies the periostitis, so that stagnation in the systemic circulation resulting from interference in the pulmonary circulation is thought to play a rôle. Because of the large percentage of cases following chronic pulmonary tuberculosis, Marie and others believed it due to tuberculosis; probably the toxins, for the pathology is not that of a tuberculous process. Others have thought it of leutic origin.

In this case it is difficult to explain the condition coming on following a metastatic sarcoma of the lung. It seems to me, however, that congenital lues should be considered as a possible factor. The large scar over the manubrium, a favorite site for periosteal gumma, and the general glandular adenopathy, seem to give this some support. Wassermann tests were negative. Still, as is well known, this may be so, especially in congenital bone syphilis. We know that the periosteum is one of the favorite sites of activity of the spirochete and that the pathologic process resulting is an ossifying periostitis. It is possible that the cyanosis of the tissues brought about by the lung condition rendered active the latent organism.

It seems possible that such a common factor might explain many cases of this condition which is preceded by such a variety of primary pathologic lesions.

Note.—The patient died November 17, 1917, and an autopsy was held the same day. Numerous tumor nodules were found in both lungs, varying in size from 0.5 to 6 cm. in diameter. These were of a pinkish-gray color. Some showed degeneration in the center, others were partially ossified. There was a left adhesive pleuritis. The left lower lobe showed a hemorrhagic solidification.

Examination of several of the bones at the seat of greatest thickening revealed a markedly thickened periosteum. These areas were dark red, apparently very vascular. Other autopsy findings were negative. Sections of the hemorrhagic consolidation of the left lower lobe showed no tumor tissue, simply broken-down tissue. The tumor nodules, on section, gave the typical picture of a spindle-celled sarcoma with areas of ossification.

SARCOMA OF UPPER END OF TIBIA

Summary: Clinical methods of differentiating bone sarcoma from tuberculosis and gumma in osseous tissue; value of x-ray analysis; treatment of present case by amputation at middle of thigh.

THIS patient, twenty-one years old, comes to the hospital because of pain, swelling, and disability of the right knee.

He attributes his present trouble to a sprain received November 15, 1916. While carrying a heavy sack of flour he slipped, twisting the knee. He was able to continue at work and there was no swelling or discoloration noted. Not until May, 1917, did pain appear. This was a dull ache, made worse by use of the knee, disappearing after rest. About the same time swelling was noticed on the inner side of the leg just below the knee. This has gradually grown, with an increasing disability, so that in the past six weeks the knee has become partly flexed, and he now walks with the aid of a cane.

Past History.—Measles in childhood; frequent attacks of tonsillitis and bronchitis in the last five years.

Family History.—He knows of no tuberculosis or tumors in other members of the family. Mother died of "stomach trouble" and a brother of "bowel trouble."

The patient denies venereal infection. The appetite has been good and he does not believe that there has been any loss of weight. In the last two weeks there has been some cough, but no sputum; there has been no dyspnea nor pain in the chest.

Upon examination we note that he is a pale, slender young man, who walks with a limp because of the flexed knee, which necessitates the aid of a cane. Upon exposing the right knee there is seen a swelling about the size of an orange occupying the mesial anterior aspect of the leg just below the patella (Figs. 128, 129). Its margins are indefinite and the contour irregular, two main elevations being apparent. Veins passing over the surface are dilated, otherwise the skin is of normal appearance. The internal hamstring tendons stand out prominently on account of passing over the swelling. Proper extension of the leg is thus limited. There is local elevation of temperature when compared with the left knee. The mass is of variable consistency, but, for the most part, soft, the anterior nodule opposite the tibial tubercle apparently showing fluctuation. The skin is freely movable. The tumor is firmly fixed to the tibia and its outlines are indefinite. The knee-joint does not seem to be involved and there are no signs of fluid in the joint.

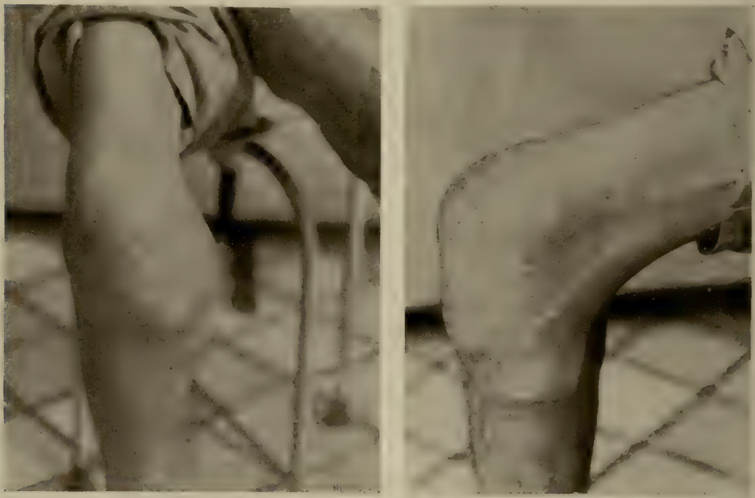


Fig. 128. Fig. 129.

Figs. 128 and 129.—Sarcoma of upper end of tibia. The extent of the swelling, the dilated, superficial veins, and the stretched tendons of the internal hamstrings are well shown.

An *x*-ray plate of the lesion shows that it involves the upper end of the tibia, which has been eroded to the extent of one-third of its diameter (Fig. 130). There are short scalloped-out areas in the bone, and no calcification or new bone formation in the growth, which stops abruptly at the articular cartilage. The lateral boundary blends with the shadow of the soft tissues and cannot be outlined.

Further examination reveals palpable lymph-nodes in the groin, both the vertical and oblique sets on the right being enlarged.

The lungs are negative. Fluoroscopic examination is negative for possible tuberculosis or metastases.

The teeth are carious and the tonsils hypertrophied.

The blood Wassermann is negative. There has been no rise of temperature during the past week since the patient entered the hospital.

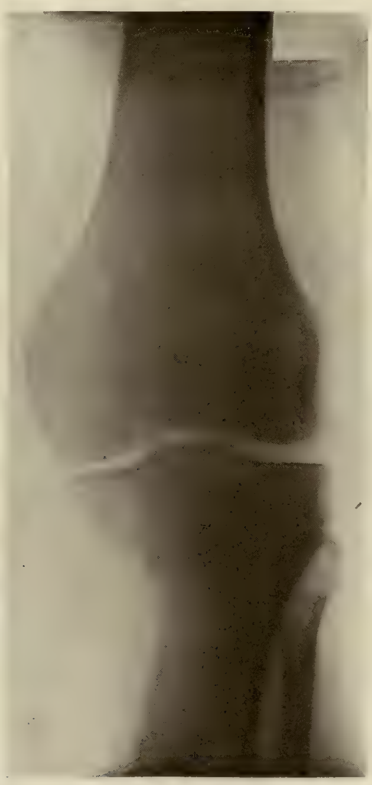


Fig. 130.—Roentgenogram showing extensive destruction of the tibia, including diaphysis, metaphysis, and epiphysis. Note absence of evidence of new bone production.

In arriving at a diagnosis we are again confronted with the problem of differentiation between a chronic inflammatory process and a new growth.

On account of the age and general appearance of the patient, and the cough, the possibility of tuberculosis should be considered.

In fact, the case was admitted to the hospital on superficial examination as one of tuberculosis of the knee. The nodular solid character of the tumor and the roentgenogram findings are, however, not those of tuberculosis. The regular outlines of the eroded areas in the bone, absence of rarefaction in the neighborhood, with absence of involvement of the articular cartilage and knee-joint, argue against such a diagnosis.

The history, the negative Wassermann, and the entire absence of new bone formation, when considered with the localization and size of the new tissue growth, speak against gumma.

We probably have to deal with a true tumor which, because of the rather rapid development and lack of encapsulation, appears to be malignant. It is most likely a sarcoma. The sharp outline of the scallops in the tibia suggest the possibility of a giant-celled sarcoma originating in the marrow.

We have advised the patient of the malignancy of the lesion and he has consented to amputation.

Operation (October 10, 1917).—In order first to determine the exact nature of the growth we will excise a piece from the most prominent part and send it to the laboratory to have a frozen section made. We come upon pink tumor tissue beneath the muscle which is quite vascular. A wedge-shaped piece is excised. The pathologist reports the growth to be a sarcoma of the large spindle-celled type without giant cells.

After applying a constrictor of large soft-rubber tubing in figure-of-8 fashion about the thigh and pelvis, we proceed to amputate at the middle of the thigh. Anteroposterior flaps are dissected up, consisting of skin, subcutaneous fat, and fascia. The muscles and other structures are incised at the proper level, the sciatic nerve being injected with 1 per cent. novocain before severing. This is done to combat shock. A cuff of periosteum is removed proximal to the site selected for the saw-cut, and the bone sawed through. The endosteum is cureted out for about $\frac{1}{3}$ inch, vessels ligated and flaps sutured, leaving a cigarette drain at one angle.

After preparing the specimen removed by cutting through its center and sawing the tibia, you see that the surface is grayish-pink and soft with very little secretion (Fig. 131). It is solid throughout and stops abruptly at the articular cartilage on top of the inner tibial tuberosity. Although it extends above the joint margin on the inner side, it has not broken through the synovial membrane. Careful examination of the veins of the thigh shows them empty, tumor tissue being nowhere found in them.

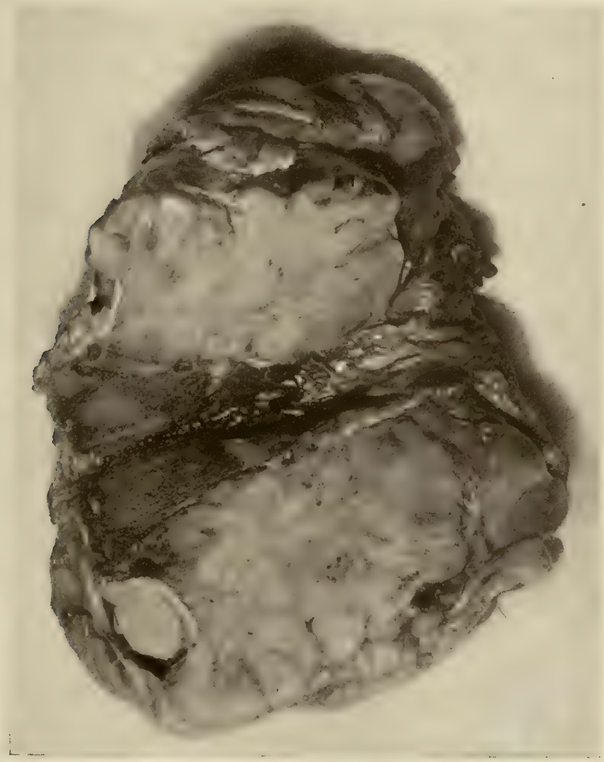


Fig. 131.—Photograph of sarcoma after removal and medial section.

The prognosis is probably not good. The duration of growth, the poor general condition of the patient, and the beginning lung symptoms already suggest metastases.

As a further aid in treatment the Coley toxins might be employed. The results reported by others than Coley with their use in such cases have not been encouraging.

GIANT-CELLED SARCOMA OF ULNA

Summary: A man with definite lues and nephritis who complains of rheumatic pains and swelling in various joints, and particularly of a large lump on ulnar side of the left wrist; differential diagnosis of giant-celled sarcoma, chondroma, multilocular bone-cyst and central gumma; operation—resection of tumor and repair of consequent defect in ulna by transplantation of bone from the tibia.

This man is thirty-six years old, a bookkeeper by occupation, who enters the hospital because of a growth on the left forearm. He also complains of pain in the ankles, left knee, and soles of the feet.

Two and a half years ago the left forearm was twisted in a tussle. The pain and disability following were slight and of only a few days' duration. Six weeks later he first noticed a small, hard nodule over the lower end of the ulna. This has grown gradually, without pain at any time, and is only slightly tender to blows and upon extreme supination of the hand. Lately there has been some noticeable weakness of the grip.

In June, 1917, there developed pain and stiffness of the neck. At times the pain was sharp and shooting in character. This lasted about one month. In September pain appeared in the back and the right ankle became swollen and tender. Shortly afterward the right elbow became swollen and painful, subsiding in a few weeks, but leaving a hard prominence over the olecranon, so that at present he is unable to completely extend the forearm. About two weeks ago a stiffness and soreness of the left knee appeared, most marked in the morning and gradually wearing off during the day after being about. Pains in the soles of the feet have become so annoying that he gets about with difficulty. To obtain relief from this is his principal reason for coming to the hospital. At no time has there been any fever or chills. Only in the last few weeks has he had to quit work.

Past History.—Typhoid fever at fifteen years. Gonorrhea and soft chancre twelve years ago. At that time there was an ulcer involving a large part of the glans penis, accompanied by "rheumatism" of several joints, which was severe and of several months' duration.

The family history is negative except for the fact that his father died of Bright's disease. He drinks whisky to great excess. He states that his work requires him to enter refrigerators, and believes that this has something to do with the present "rheumatic condition."

Upon examination we note that he is of slender build and apparently in good health.

At the left wrist on the ulnar side is a swelling about the size of a hen's egg, occupying principally the dorsal and inner aspects. The skin over it appears normal. Movement of the hand is not painful and only limited to a small degree by the growth. To palpation the latter is irregular in contour, but sharply limited. The consistency is variable, most parts being quite hard. The skin is freely movable. The growth is attached to and a part of the ulna, the inner margin of which forms a groove between the two most prominent parts of the tumor. Movement shows the muscles to pass over the mass.

Further examination reveals a marked pyorrhea alveolaris. A small raised area over the right olecranon, probably a result of periostitis, is present. There is slight swelling and tenderness of the soft tissues below the left knee, the joint being entirely free. There is moderate edema of the ankles. Tenderness to pressure is quite marked on the plantar surfaces of both feet, most marked over the os calcis at the attachments of the plantar fascia and tendo achillis.

In order to approximate a diagnosis of the ulnar lesion we will have to depend largely upon the *x*-ray examination. Clinically it shows none of the signs of an inflammatory process.

The blood Wassermann is 4 plus. The urine shows a large amount of albumin and many granular casts.

An *x*-ray plate has been made, and you note that the picture is that of a new growth of a type which has expanded and nearly obliterated the lower end of the ulna, only the inner margin of the bone remaining (Fig. 132). It shows a thin, bony shell, the outline of which remains unbroken. You note also that there are delicate trabeculæ through the interior of the growth. There is some rough thickening of the periosteum of the shaft just above it. This appearance fits in best with a tumor which has probably had its origin in the interior of the bone, producing expansion to its present globular shape by bone absorption. This is probably a sarcoma of giant-celled type, called by some myeloma.

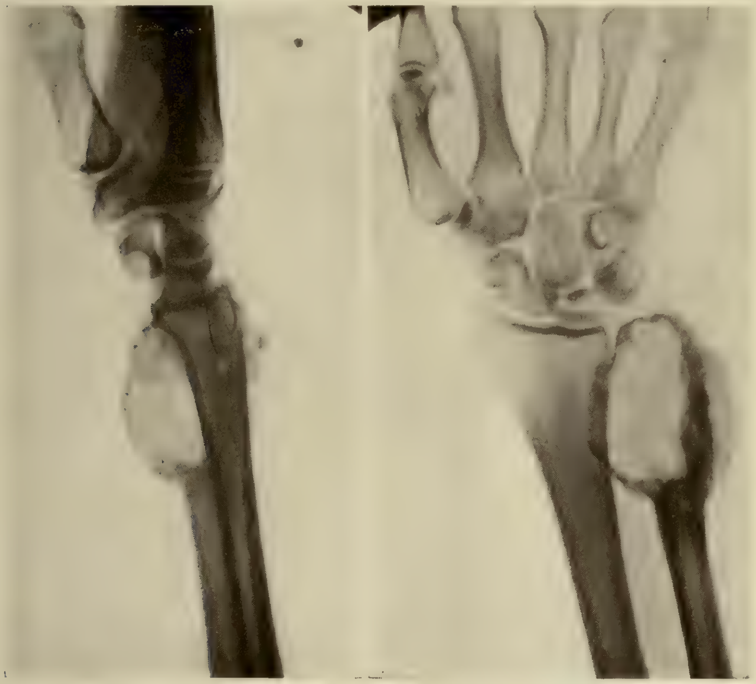


Fig. 132.—Roentgenogram showing expansile rather than infiltrating tumor of ulna. The unbroken bony shell and the sharp demarcation, the absence of areas of calcification, and of definite subdivisions within the swelling are the striking characteristics.

A chondroma shows more mottling due to the areas of calcification. Furthermore, chondroma does not involve the epiphysis, and is of slower growth unless undergoing malignant change.

Multilocular bone-cyst is a variety of chondroma, which in the *x*-ray plate shows more clearly marked outlines of the lighter areas than is here present. The bone expansion is also less as a rule.

Central gumma shows a denser shadow, with irregular outline and without structure. Rarely it gives a multiple cystic appearance, but there is an accompanying cortical new-bone formation. It usually involves the shaft, very rarely the epiphysis. There should also be some clinical evidence of inflammation.

In this case the *x*-ray appearance, with the history of a very slow growth of two and a half years, and the clinical findings without infiltration of the surrounding tissues, bear out a diagnosis of myeloid giant-celled sarcoma of benign type.

This variety of sarcoma of the long bones is held by most authorities to be essentially a benign growth. Bloodgood and many others believe that it never forms metastases to the lymph-nodes or viscera. Coley and others cite cases to show that metastases, although showing giant cells in sections, are clinically of rapid growth with early cachexia. The typical myeloid giant-cell sarcoma is of very slow growth and on removal gives rise to only local recurrence. It occurs most commonly in the jaw and lower end of the femur, radius and ulna, and is amenable to local removal either by curet or resection. Bloodgood reported 7, and Nasse 8, cases of this type of tumor in which local removal was carried out, without metastases, although a few recurred locally. Some text-books speak of this tumor as a myeloma, meaning simply a new growth of the marrow, but it seems that this term had best be reserved for the multiple tumor growths of the marrow characterized by the presence in the urine of the Bence-Jones body.

The tumor of the ulna is the main object of interest in this case. The diffuse painful foci may be periosteal, possibly of luetic origin, and would seem to be a pathologic process having nothing to do with the new growth of the ulna. Inasmuch as there is no apparent infiltration of the soft tissues and a good functional result is assured, we have decided to resect the tumor with a part of the ulna. Should there be recurrence, amputation can then be carried out.

x-Ray plates of other bones of the body are negative except for some periosteal thickening over the right olecranon.

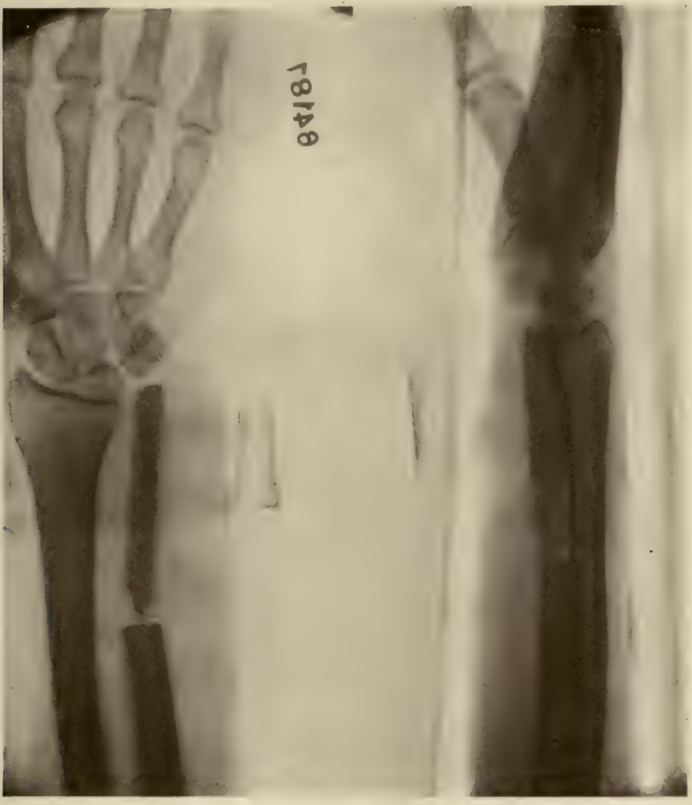


Fig. 133.—Two weeks after operation. Tibial transplant now occupies the former site of the tumor.

Operation.—After proper preparation we make an incision 5 inches long over the inner side of the tumor and ulna, separate the muscles, and saw off the ulna 1 inch above the growth with the Gigli saw, using Lane technic throughout. Grasping the free end of the ulna with bone-holding forceps, the tumor is removed intact, principally by blunt dissection. A piece of bone

3¼ inches long and ¼ inch wide is then removed by means of the circular motor saw from the mesial surface of the left tibia, being careful to preserve the periosteum. Experimental work tends to show that it is of distinct advantage to leave on the periosteum. The medullary cavity of the ulna is hollowed out for a short distance, and one end of the graft sharpened to fit into it. The graft is then wedged into the ulna, no other means of fixation being used, and the soft tissues sutured over it with No. 1 iodized gut. A subcuticular stitch is then inserted and the forearm put up in anterior and posterior padded splints. We expect to keep the forearm immobilized for about four weeks and then begin massage and passive motion.

This tumor removed now shows definite "egg-shell" crackling due to the very thin layer of bone. You see that there is a thin layer of muscle over the anterior surface removed with the tumor. Sawing the growth through the center, the cut surface appears quite homogeneous, smooth, and dirty yellow, resembling very much a gumma. There are evident some bone trabeculæ (Fig. 133).

Note.—The pathologist reports that the section is that of a mixed cell sarcoma with many large multinucleated giant cells.

CLINIC OF DR. DAVID C. STRAUS

MICHAEL REESE HOSPITAL

EXTENSIVE COMPOUND ELEVATED SKULL FRACTURE, WITH CONSIDERABLE LACERATION OF THE BRAIN

Summary: History of case—the examination—the diagnosis—the operation; postoperative course; drainage in cases of skull injury; the healing of bony defects of the skull.

THE patient, Peter G., a boy ten years of age, was brought to the hospital in an ambulance the morning after July 4, 1917. He was unconscious and had a bandage about his head.

His brother, who accompanied him, gave the following story of the accident: The boy, who had been playing baseball in a lot, was called over by some other boys who had found some explosive in a large country milk can. They had attempted to set off the explosive, but it did not explode as quickly as they thought it ought to, and believing that they had not ignited it, they asked Peter to lift off the lid, which was quite heavy. Just as he was about to lift off the lid the explosion occurred, and the lid was blown up, striking him a terrific blow in the forehead. People who witnessed the accident say that the top of the can, after striking him in the head, blew up in the air about five stories.

When the boy was reached he was unconscious and was bleeding from the wound in his head, which exposed his brain, and brain tissue was scattered over his forehead and hair.

He was at once taken to a hospital, but after they had applied a dressing, his brother decided to bring him to the Michael Reese Hospital.

I saw him as soon as he was brought into the hospital, and took care of him immediately. On removing the bandage from about his head it was seen that the explosion had lifted up a large osteoplastic flap in the right frontal and temporal region. There was a long curved cut extending through the entire thickness of the scalp and the skull, with elevation of a flap extending from the median line in the neighborhood of the coronal suture, downward in a curve almost to the right superciliary ridge, and then curving upward and backward to the right temporal region (Fig. 134, *a–b*).

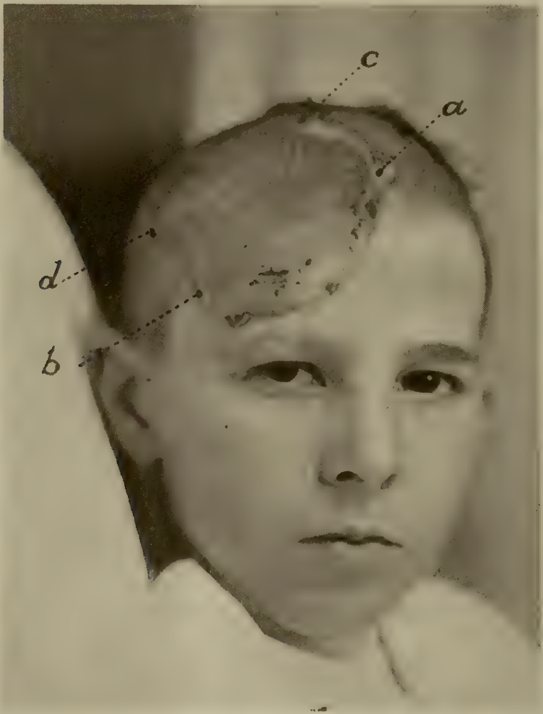


Fig. 134.—Photograph of patient taken July 22, 1917, eighteen days after operation. The distance *a–b* shows the extent of the accidental scalp wound; the extensions *a–c* and *b–d* were made at operation. The two granulating areas along the line *a–b*, one above each canthus of the right eye, show the points where drainage was instituted.

This osteoplastic flap was elevated about 1 inch, so that one could easily have inserted the entire side of one's hand into the skull. The brain lay freely exposed and one could plainly see its expansile pulsations. Also one could see that the dura was torn and that the brain was lacerated. There was blood and brain matter matted in the hair, which lay in the wound where this extended in the hairy scalp.

Before attending to the local injury a brief but rather complete general examination was made.

The boy presented the typical picture of severe cerebral concussion. He was unconscious, in shock, and had a rectal temperature of 96.2° F. and a pulse of 48. His pupils were widely dilated. There was some bleeding from the mouth. This was, in part at least, due to the fact that a tooth had been broken away, the right lower cuspid. Furthermore, there was some blood in the right ear, though no actual bleeding. This apparently had flown in from the scalp cut, rather than from a basal skull fracture through the petrous portion of the temporal bone. The existence of a basal skull fracture was thought of as possible, by extension to the base of the fracture of the vault. However, no definite proof of this was obtainable, although the evidence mentioned made this possible, if not probable Though unconscious and not to be roused, the boy tossed about restlessly. He was therefore given a hypodermic injection of morphin sulphate, gr. $\frac{1}{8}$, and atropin sulphate, gr. $\frac{1}{150}$. Examination of the extremities showed that the deep or tendon reflexes, that is, biceps-jerk, triceps-jerk, supinator-jerk, knee-jerk, ankle-jerk, were present, normal, and equal on both sides, thus showing that there was probably no upper motor neuron lesion. The Babinski test was negative, thus making the absence of an upper motor neuron lesion probable, though this is not conclusive, because immediately after a lesion Babinski sign and exaggerated reflexes may not be in evidence, but may appear later. Indeed, the reflexes are frequently absent immediately after such a severe trauma. One would not expect any paralysis if the lesion were limited to the right frontal lobe, for this, you no doubt remember, is not a motor area, but is a silent area. The motor areas are limited to the two precentral gyri, the right precentral gyrus being the motor area for the left side of the body, and the left precentral gyrus being the motor area for the right side of the body. The precentral gyrus is the convolution just in front of the fissure of Rolando. It was formerly believed that the motor area extended behind the fissure of Rolando, and included part of the postcentral gyrus, that is, the convolution just posterior to the fissure of Rolando. We now know that the motor area is confined to the precentral gyrus.

An important point to remember in a case such as this one is that even though a blow is sustained on the right side of the head, one has to think of the possibility of an injury to the opposite side of the skull and brain by contrecoup. As just explained, the findings in this case ruled out the existence of any injury to the left motor area.

As it was evidently impossible to properly clean the wound and the area about it while the boy tossed about, as soon as the examination was completed he was taken to the operating room and given a gas-ether anesthetic. After he was anesthetized the area about the wound was shaved widely, cleaned with green soap and water, then with alcohol, ether, and half-strength tincture of iodin. Finally, the area immediately about the scalp cut was similarly cleaned, but care was taken not to allow any of the solutions to enter the wound.

Operation.—The head was laid on the left side and was supported on a sand-bag. The two extremities of the scalp wound were next extended posteriorly, using a scalpel, and following the line of fracture, first on the medial side (Fig. 134, *a–c*) and then on the lateral side (Fig. 134, *b–d*), until the entire length of the fracture was exposed. By doing so each extremity of the skin cut was prolonged, first somewhat laterally, and then posteriorly, so that when the entire fracture was exposed a horseshoe-shaped skin flap had been cut (Fig. 134, *d–b–a–c*). This was approximately anteroposterior in position, with the pedicle posteriorly (Fig. 134, *d–c*). The pericranium was next cut through immediately over the fissured part of the fracture (Fig. 134, *a–c* and *b–d*), and then the anterior and posterior edges of the pericranium were pushed away from the line of fracture for a short distance, the anterior edge anteriorly, and the posterior edge posteriorly, by means of a periosteal elevator. Then the elevated anterior part of the horseshoe-shaped osteoplastic flap was strongly raised by means of a periosteotome, elevating the flap until the bone-flap fractured at its base (Fig. 134, *d–c* and Figs. 135, 136). The entire osteoplastic flap was now turned upward as one mass, exposing the dura beneath this entire area of the skull. There was considerable foreign material lying on the dura, and some lying on the inner surface of the elevated bone-flap. Before dealing with this foreign matter the margin of the osteoplastic flap was swabbed with pure tincture of iodin, as was also the margin of the scalp and skull from which this osteoplastic flap had been elevated. In the treatment of compound skull fractures when gross dirt has been driven into the edges of the scalp cut or when the margins of the scalp

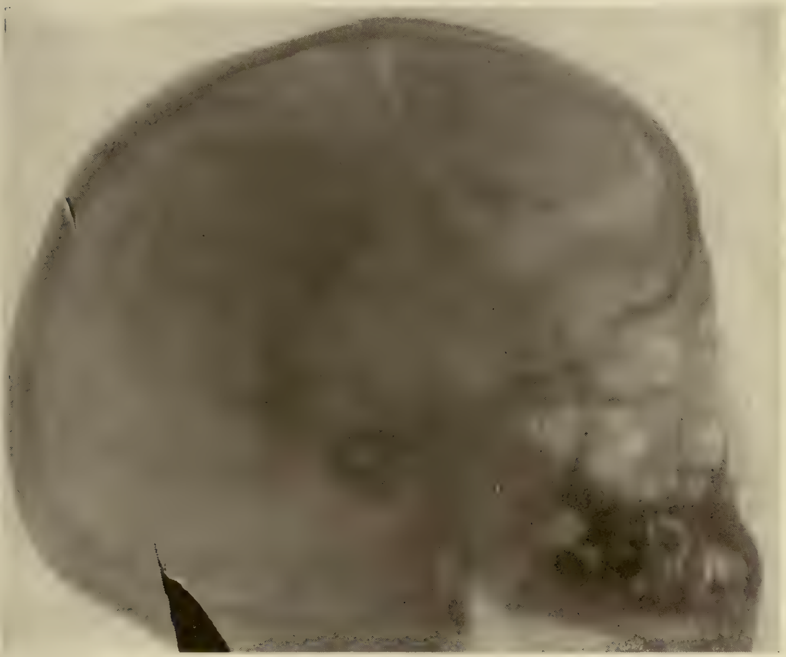


Fig. 135.—Lateral roentgenogram taken July 17, 1917, twelve days after operation. Note the size of the osteoplastic flap. Also note the extent of the bony defect, the result of cutting away with a rongeur forceps the margins of the bone-flap, and also the margin of the skull from which this has been raised, in order to be certain to remove all the infected bone.

wound have been devitalized, one should excise the margins by the use of a sharp scalpel. That did not seem necessary in this case. Two free fragments of skull bone were seen projecting into the substance of the frontal lobe of the brain, and there were two tears in the dura, through which the two bone fragments had been driven into the brain tissue. Each of these tears in the dura was approximately $\frac{1}{2}$ inch in length. They were situated in the line of the original cut, and were separated by a bridge of intact dura. These tears in the dura were located along the line *a–b*, Fig. 134, one above each canthus of the right eye. Drainage was subsequently introduced at these two points. Before proceeding to deal with these depressed fragments, or to inspect the damage done to the brain, the foreign matter lying upon the dura and on the inner surface of the bone-flap was gently irrigated away with a 1 : 10,000 solution of bichlorid of mercury, from a percolator fitted with sterile tubing to which a fine glass irrigating point was attached. Then the

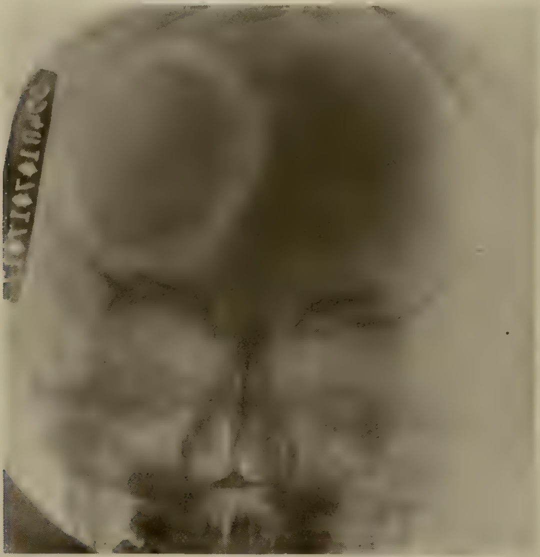


Fig. 136.—Anteroposterior roentgenogram taken July 17, 1917, twelve days after operation. The findings correspond to those in Fig. 135.

two fragments of bone were removed from the substance of the frontal lobe, and following this the cavities in the brain from which these had been extracted were gently irrigated with the same solution. The tip of the right index-finger was then introduced into the medial cavity in order to determine whether any other bone fragments were present, but none were found. The lateral cavity was examined in the same manner, but no other fragments were to be found here either. However, this examination disclosed the fact that both openings led down into one large cavity in the frontal lobe, and that this cavity was covered only by the bridge of dura between the two tears.

Next, the margin of the bone-flap was cut away with a rongeur forceps (Borchardt's), as was also the margin of the skull from which the flap had been raised. About ¼ inch of the margin of each was removed. This was done in order to remove all the infected bone caused by the contact with the top of the can. A broad horseshoe-shaped bony defect thus resulted (Figs. 135, 136). Then, in order to be sure that no depressed portion of the inner table had been overlooked and left depressed, a thin, delicate brain elevator was introduced between the dura and the inner surface of the skull, all about the edge of the wound. The depressed parts having been elevated, the entire wound was again irrigated and carefully cleaned. A small, soft-rubber drainage-tube was introduced into the cavity in the frontal lobe, passing it in through the lateral tear of the dura and out through the medial tear, so that the drainage-tube lay just beneath the dural bridge. The osteoplastic flap was next replaced, and one end of the rubber drain came out to the medial side of the anterior part of this flap, and the other end came out from beneath the lateral side of the flap, that is, through-and-through drainage was instituted.

In regard to the use of the rubber drain in this case, which may be criticized by some surgeons, I wish to call attention to the advice of some of the foreign surgeons as the result of their recent experiences in the present war. Thus, Guleke[1] believes that in cases with considerable destruction of brain tissue early decompression and drainage should be provided for the traumatic cerebral edema and the constant outpouring of brain detritus.

He personally prefers a soft-rubber drain. Similarly, Delore and Arnaud[2] advocate the use of a rubber tube for drainage in cases in which the brain is extensively injured, and advise that the tube should be left in for a long time to permit the free drainage of the broken-down brain tissue and the products of inflammation. They warn against the use of gauze drains in such cases. In case a brain abscess has developed, Burkhardt[3] strongly denounces gauze drains and gutta-percha drains as insufficient; Erdelyi[4] states that rubber tubes give the most satisfactory drainage, and von Eiselsberg[5] is of the same opinion, but points out that a rubber drainage-tube should not be allowed to remain down in the abscess cavity for more than twenty-four to forty-eight hours for fear that prolonged pressure may cause pressure necrosis and thus perforate into the ventricle. At the end of this time he shortens the rubber tube, though he does not remove it completely. Although a rubber drain was used in this case, and although, as has just been pointed out, such drainage is recommended by surgeons of wide experience, in general it is best not to put any tube or gauze plug in the cerebral substance.

Finally, the osteoplastic flap was sewed in place, using No. 1 plain catgut to close the pericranium and the musculo-aponeurotic layer, interrupted stitches being used, and then the skin was closed with a running suture of No. 3 black waxed silk, interrupting this a few times. Room was left about both ends of the drain so as to insure free drainage. Thiersch powder and dry dressings were then applied. The patient left the operating room in good condition. His color was fair and pulse was good —72 per minute.

While some surgeons have advocated leaving such wounds widely open to assure good drainage, or only closing the skin edges with a few stitches, Burkhardt[6] has recently pointed out that his experience has convinced him that the infective material that is carried into the brain in case of smaller wounds of the brain give rise to severe infections in only the most exceptional cases. In these cases the infection developing after the operation is, in the great majority of cases, a secondary infection due to the care of the wound, just as a joint, in spite of aseptic dressing, is sure to become infected if it is left widely open. He believes that the best means of combating this secondary infection is to sew the skin together, but not to close it completely, as has been advocated by some authors (Jeger and Karzer). He inserts a drain and closes the skin up to this, as he believes that in this way he gains the advantages of both the complete aseptic covering and at the same time efficient drainage.

Postoperative Course.—He became conscious at 3.30 in the afternoon, was able to take fluids in small amounts by evening, and only vomited once at 7 P. M., and did not vomit again that day. He complained of pain in the head.

Because of this pain and restlessness he was given morphin sulphate, $\frac{1}{10}$ grain, hypodermically, at 12.30 A. M. By morning he was rational and perfectly clear mentally, though rather somnolent. He seemed in good condition. He vomited a little clear fluid at 3.30 A. M., but did not vomit again that whole day, and was able to take and retain 31 ounces of fluid by mouth. His temperature (rectal) varied between 99.6° F. and 100.4° F., and his pulse varied between 72 and 100. He spent a fairly good night, sleeping most of the time.

When I saw him the next morning, July 7th, his condition was about the same as the day before, and he was still rather somnolent, though perfectly clear mentally. I removed the dressings from his head in order to remove the rubber drainage-tube. In place of the rubber drainage-tube I inserted two short gutta-percha tissue drains, each going through the scalp openings only. Dry dressings were applied. He had a good day and was given a light soft diet in the afternoon. He did not vomit at all that day. His bowels moved twice. At 8 P. M. his temperature (rectal) was 101.4° F. and pulse 84. He spent a fair night.

The next day, July 8th, he seemed brighter mentally and less somnolent, and told about lifting the cover from the milk can. His brothers came to visit him and he recognized them at once. Temperature around 100° F. and pulse 80 to 90.

July 9th his condition was just about the same. He was bright and took nourishment well, but complained of pain in the region of his wound, and said the pain was worse than up to this time. Examination showed no stiffness of the neck, no Kernig sign, reflexes not increased, and no evidence of a beginning meningitis.

July 10th he seemed about the same. Because of the pain complained of the dressings were changed. There was some purulent discharge from the lateral drainage opening. This, of course, accounted for the pain.

The next day, July 11th, the dressings were again changed and pus was again present.

By July 13th the purulent discharge was more profuse and was now present in both drainage openings. The next day the stitches were removed from the posterolateral and posteromedial extremities of the horseshoe-shaped skin cut, and a posterolateral and posteromedial drain of gutta-percha were inserted in addition to the two anterior drains. After this time the amount of drainage gradually but steadily decreased.

On July 16th all remaining stitches were removed and all drains were removed and left out except in the anterolateral opening.

On July 19th roentgenograms of the skull were taken to determine whether any loose fragment was present that was keeping up the discharge, but no bone fragment or foreign body could be demonstrated. The position of the osteoplastic flap was shown to be excellent (Figs. 135 and 136).

The next day the last drain was permanently removed.

On July 22d I took a photograph of the boy sitting up in a wheel chair (see Fig. 134).

The following morning, July 23d, he complained of headache and some nausea, and he looked pale and did not seem so well. Both anterior wounds, where drainage had been maintained, were again opened and a little pus retention relieved, and two gutta-percha drains were again inserted. By evening his temperature was normal again and his headache gone.

By July 26th the drains could be permanently removed.

From this time on the wounds, where the drains had been, granulated, and had to be cauterized at times as the granulations became exuberant. By August 6th all discharge had ceased and it was decided to send the boy home in a day or two.

On August 9th he developed a severe tonsillitis with a rectal temperature to 104.2° F., and on account of this he had to be kept in bed again. It was not until August 14th that he recovered sufficiently to let him get out of bed again. Four days later he was sent home, with instructions to return for dressings, as the two anterior wounds were not yet completely healed.

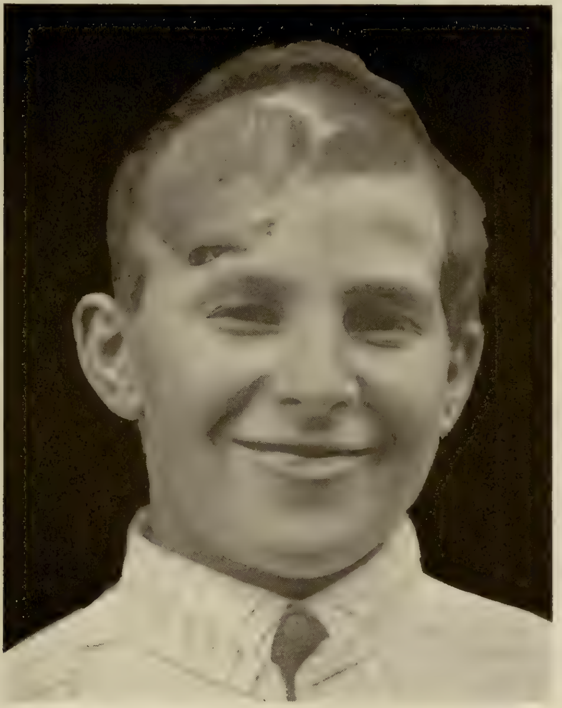


Fig. 137.—Photograph September, 1917. This shows the persistent, granulating wound where the lateral portion of the drainage-tube had been introduced, and from which, in September, a small spicule was spontaneously extruded, following which healing promptly occurred.

The anteromedial wound soon closed and remained closed. The anterolateral wound continued to be moist and discharged a very little pus from day to day. One day in September a small spicule of bone spontaneously appeared on the surface of the granulating wound. This was removed and the wound was cauterized with silver nitrate stick, as had been repeatedly done before. Following this extrusion of the small sequestrum, the wound rapidly closed and has remained closed (Fig. 137).

The first week in October I took his photograph (Fig. 138), as the wound was then entirely healed. I also had roentgenograms taken to determine the amount of filling in of the defect. As you will note, by this time considerable osteoid tissue had developed (Figs. 139, 140). These roentgenograms show that instead of the sharp clean-cut bony margins of the defect, the margins appear less sharp and clean cut, and that in the space between the margins the defect now shows more or less bony substance present. However, at this time the osteoplastic flap still showed visible pulsations and could be rocked by pressure with the examining hand, as it had done from the time of the operation. It was not until December that the defect no longer

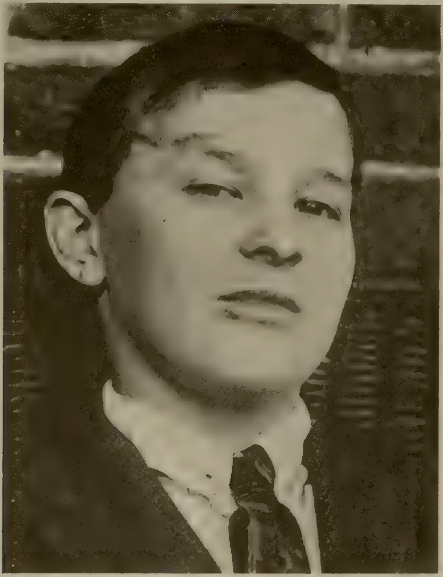


Fig. 138.—Photograph taken first week in October, 1917. Shows wound entirely healed.

showed visible pulsations and was so firm that palpation showed it to be rigid.

Finally, it may be of interest to say a few words concerning the spontaneous closure of bony defects in the skull.

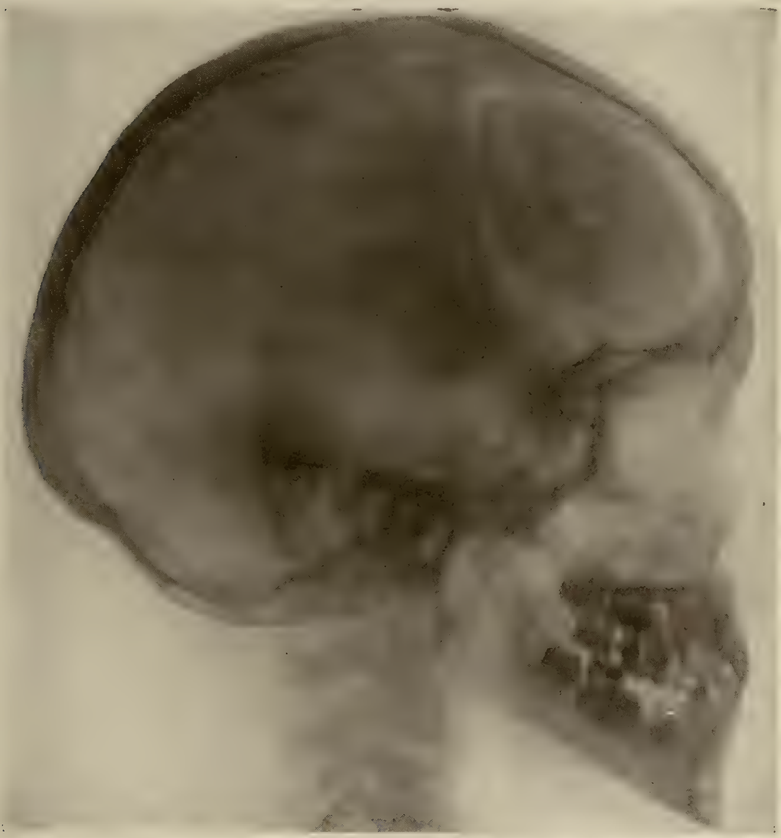


Fig. 139.—Lateral roentgenogram taken October 13, 1917, three months after operation. Note how the defect has partially filled in with osteoid tissue, and that, instead of the sharp, clean-cut bony margins of the defect, the margins have become indistinct. This is due to the fact that the sharp bone edge is being absorbed while new bone tissue is being deposited to fill in the defect.

Küttner[7] states that the old teaching remains unshaken even today—that the possibility of regeneration of the convex skull bones in case of loss of substance is very slight, and, therefore, defects of any consequence, as a rule, do not ossify, but only become closed by connective tissue. A few authentic cases of bony closure of such defects by means of bone regeneration have been reported in recent years, but these, he believes, are nevertheless only exceptions worthy of note, and only go to prove the rule. Such exceptional cases are recorded in von Bergman's Surgery of the Head, and since that time a few other cases have been reported, as those reported by E. Küster and Hofmeister.

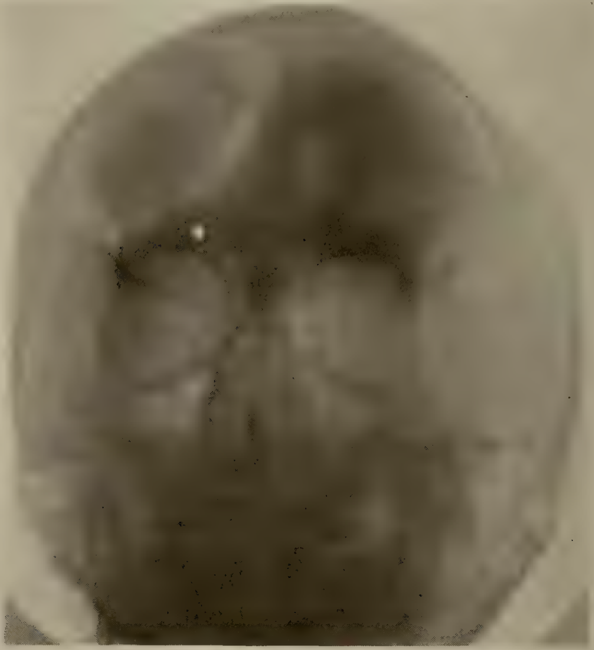


Fig. 140.—Anteroposterior roentgenogram taken October 13, 1917, three months after operation. The findings correspond to those in Fig. 139.

Krause[8] states that small defects usually become filled, also in adults, by such a firm scar that an operation to close it is not necessary. In children, when both the pericranium and dura are retained, ossification proceeds from the bony margins of the defect, while the central portion usually remains composed of fibrous scar tissue.

Tilman[9] teaches the same.

Cushing,[10] on the other hand, states that even defects of some size may at times become entirely ossified, and even when closed by membrane alone they may become so firm and inelastic as to show no pulsation.

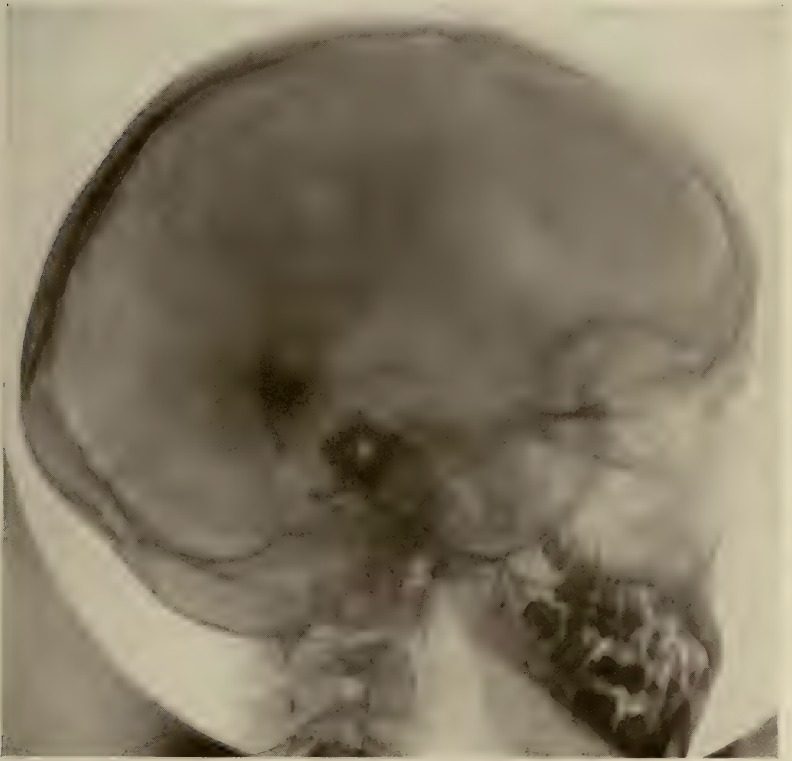


Fig. 141.—Lateral roentgenogram taken December 13, 1917, five months after operation, when the osteoplastic flap no longer showed visible pulsation and was firm on pressure. Note that the flap is still in good position and the wide channel separating it from the remainder of the skull is filling in with osseous tissue.

According to von Bergman[11] defects cannot be expected to close if they exceed 6 to 8 cm. in diameter, and it would seem that it is rare even for much smaller defects to become filled in with bone.

Küttner[12] points out that numerous defects undergo a partial closure and show rudiments of bone formation, but it is nevertheless true, in general, that a complete bony closure of larger defects belongs to the exceptions, and that in case of defects of more than 6 to 8 cm. in diameter is not to be expected.

Axhausen[13] states: "We know that on account of the very poor osteogenic capacity of the bone of the skull the spontaneous closure of even a small defect does not follow." In all the cases operated upon by Axhausen, even in the oldest, there was no attempt at formation of new bone and the margins of the defect were almost as sharp as when the primary operation was completed. In order to secure complete restoration to a normal condition, he states, a secondary filling of the defect is necessary. During the last year he has operated upon 28 cases.

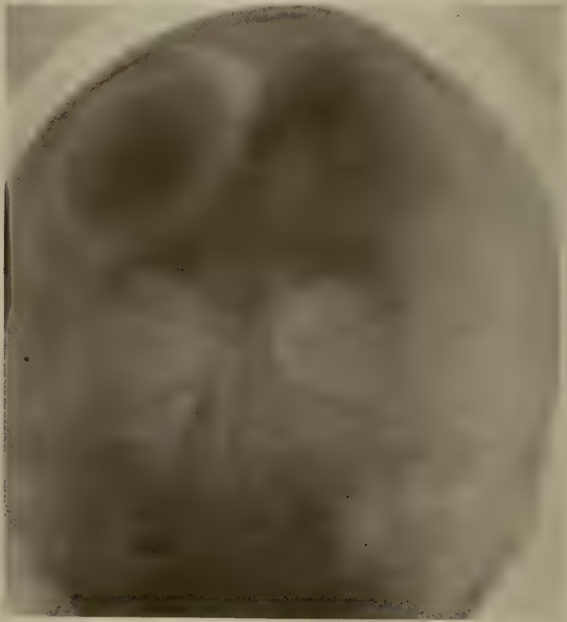


Fig. 142.—Anteroposterior roentgenogram taken December 13, 1917, five months after operation. The findings correspond to those in Fig. 141.

In this connection the roentgenograms taken in this case after the lapse of three months and again at the end of five months (Figs. 139–142) are interesting, for they show a definite progress in the ossification of the defect. At the time the last roentgenograms were taken the osteoplastic flap was firmly immobile, felt rigid, and pulsation of the osteoplastic flap was no longer present. The boy is apparently perfectly well, and his mentality is excellent.

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CLINIC OF DR. A. J. OCHSNER

AUGUSTANA HOSPITAL

GALL-STONES: CHOLECYSTOTOMY VERSUS CHOLECYSTECTOMY

Summary: A patient with cholelithiasis as a part of her abdominopelvic pathology; cholecystectomy as a routine procedure in the absence of definite organic obstruction of the cystic duct to be condemned; the gauze pack in cholecystotomy—Dr. Ochsner's technic.

History.—The patient, a married woman of forty years, was admitted to the hospital September 12, 1917, because of a burning pain in the lower abdomen, a feeling of weakness in the back, and a pain in the right upper quadrant of the abdomen.

Her mother died of nephritis at the age of forty-nine. The family history is otherwise negative. She had chickenpox and mumps as a child, measles at eighteen, with which she was sick three months. At nineteen she had "stomach trouble," which caused sharp, stabbing pain in the upper abdomen, worse at night. She says that food relieved the pain for half an hour. She was nauseated often and vomited a few times, but never saw blood. She had tarry black stools at the time and had had several fainting spells. She lost 30 pounds in weight in three months. She was in the hospital two and one-half months twelve years ago on a milk diet. After this the stomach trouble was better, and for nine or ten years she had no symptoms. Since last fall (1916) she has had two or three light attacks of pain in the epigastrium. She had rheumatism three years ago following la grippe and a middle-ear suppuration. This lasted for eight weeks, but she has had many attacks of "rheumatism" since, mostly in the great toes. For the past sixteen years she has had four or five attacks a year of pain in the right inguinal region. These attacks were called "appendicitis" by the physician. She had cystitis four years ago lasting three weeks.

Menstruation began at twelve and one-half years. Periods came on every three weeks until she was twenty-eight years of age, and since then have come on every twenty-five days. She has been married four years and has one healthy boy. She has had no miscarriages. Several years ago she had leukorrhea, but none since the birth of the child.

She drinks two cups of coffee a day and eats heartily, but takes no alcoholic liquors. The bowels are regular.

She comes to the hospital because of the burning pain in the lower abdomen, a feeling of weakness in the back, and pain in the right upper quadrant. She thinks the trouble has been worse since the birth of her child, and has been told that she has prolapse of the uterus.

Physical Examination.—The patient is a well-developed, moderately obese woman. Color is good and skin is clear. Head, neck, chest, heart, and lungs are negative. There is marked tenderness with spasm in the right upper quadrant and over McBurney's point, and moderate tenderness in both lower quadrants of the abdomen, especially pronounced in the right. There are no masses palpable. The uterus is prolapsed. The cervix is lacerated and nodular. There is a marked cystocele and rectocele present. No rectal examination was made.

COMMENTS

DR. OCHSNER (September 13, 1917): In this case we now know that the gall-stones are confined to the gall-bladder proper, because I have examined the gall-bladder and ducts through this long median incision. I have just completed the removal of the appendix and the shortening of the round ligaments which support the uterus. Consequently, it will not be necessary to make an incision here large enough to introduce my hand for the purpose of examining the ducts (Fig. 143). Many years ago the statement was made that it was not possible to examine the gall-bladder properly without making an incision sufficiently large to introduce the entire hand, and undoubtedly that statement was correct, because with only one or two fingers it is not possible to determine whether stones exist in the cystic, hepatic, or common duct. Now, through this little buttonhole which we have made we have brought the gall-bladder into view and placed three forceps upon it; two of these forceps are being held by my assistant and one by myself while I plunge the trocar into the gall-bladder (Fig. 144, 1). This trocar was introduced into this operation some years ago by my brother, Dr. Edward Ochsner, and consists of a large size trocar with a side tube so arranged that when the trocar is introduced into the gall-bladder the bile can be made to flow out of the gall-bladder through the trocar, and is conducted into a basin by the rubber tube, so that no bile can soil the operative field. Then I enlarge this opening and swab out the gall-bladder by means of this gauze (Fig. 144, 2).

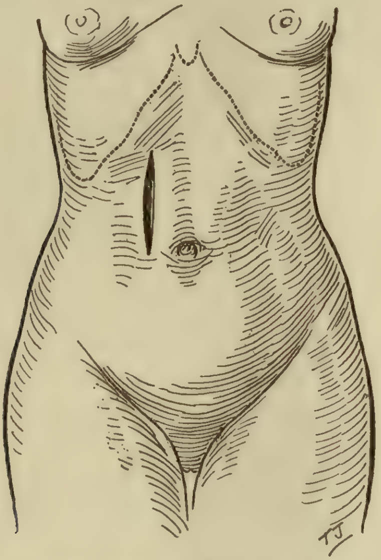

Fig. 143.—Line of incision through upper right rectus muscle. This is the typical incision for cholecystotomy which Dr. Ochsner has employed for many years, and not the "stab-wound" mentioned in connection with the case operated on.

Now, this patient gives a history of having had gastric trouble for eleven years. She has gall-stones, and they probably got

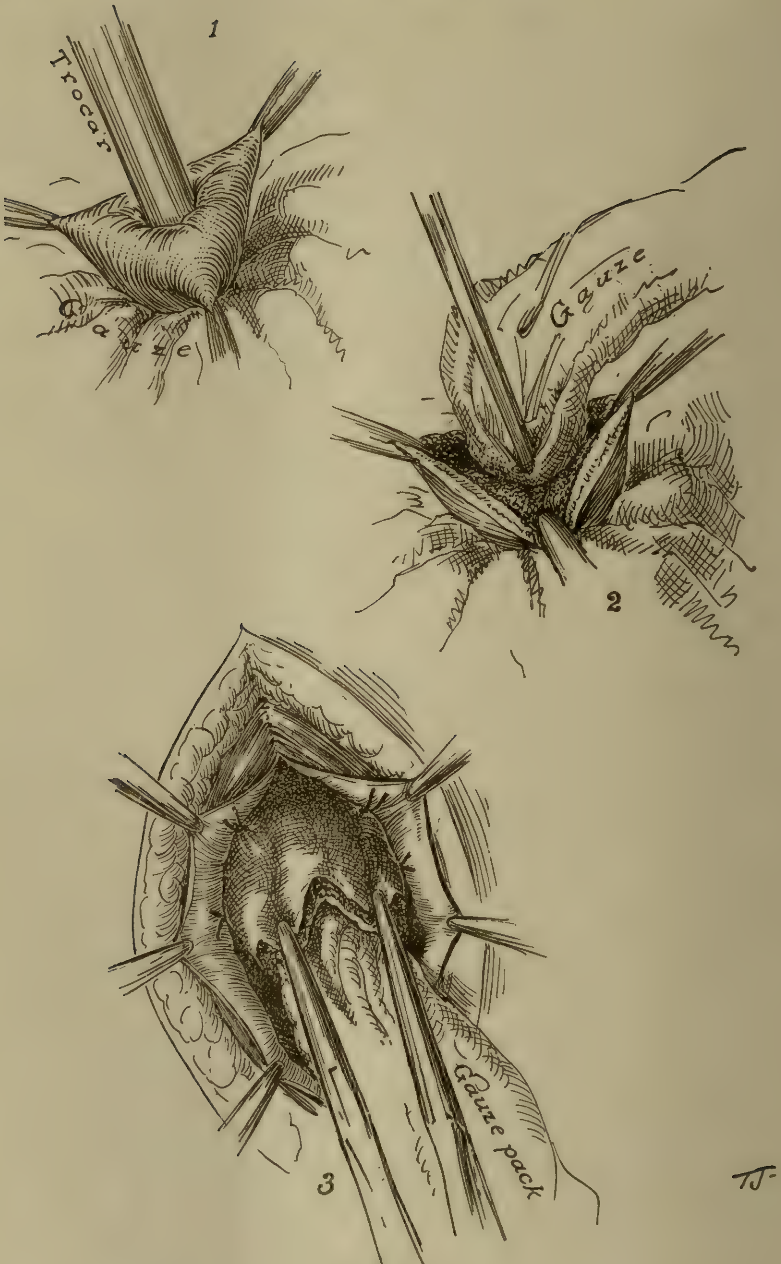

Fig. 144.

into the gall-bladder just about that time. Most of them are too large to pass out through the cystic duct, and, consequently, she is not likely to have had a typical gall-stone colic. Now I have removed all the stones. Now the question arises: Shall we remove this gall-bladder or shall we leave it in place? The lining of the gall-bladder is granular and congested, and that condition is looked upon at the present time as sufficient reason for removing the gall-bladder.

Dr. Stanton, of Schenectady, N. Y., who has had a large number of his own gall-stone cases and who has studied a large number of other cases as to the results, is convinced that in these cases if drainage is made by means of a drainage-tube a large proportion will have further trouble. On the other hand, if the gall-bladder is tamponed with gauze, which is left in place for five days or a week after the gall-bladder has been sutured to the peritoneum and transversalis fascia, these patients recover perfectly and permanently (Fig. 144, 3). In other words, it seems as though the pressure of the gauze upon the lining of the gall-bladder is what restores it to the normal condition, and attaching the gall-bladder to the peritoneum and transversalis fascia prevents the tissues from becoming strangulated again and prevents the accumulation of bile. If there were no free flow of bile through this gall-bladder, that is, if the cystic duct were obstructed and the mucous lining of this gall-bladder was still in the same condition in which we find it today, we would remove the gall-bladder. We would expect to find an accumulation of mucus in the gall-bladder which could not be drained through the common duct into the duodenum, and that there would be further trouble, but where there is a free flow of bile and we can be sure of a perfect drainage of the gall-bladder, then the reason for the removal of a gall-bladder disappears.

We make use of a very important law in surgery—never to

Fig. 144.—The gall-bladder has been grasped with three hemostatic forceps and the trocar plunged into the fundus. After draining the bile, the trocar is removed and the opening enlarged. 2. The forceps grasp the edge of the gall-bladder. Stones, bile, and mucus are removed by scooping and swabbing. 3. Method of suturing gall-bladder to the peritoneum and transversalis fascia.

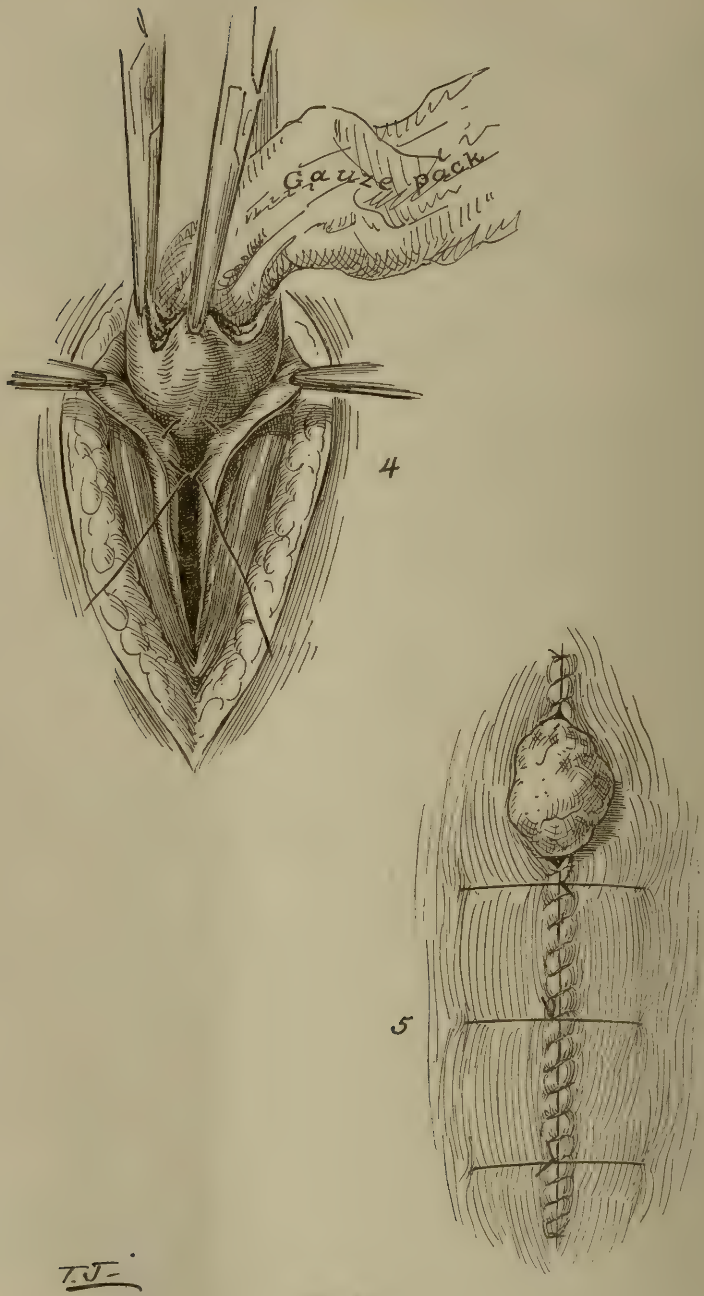

Fig. 145.

remove anything unnecessarily. Having good drainage makes the removal of this gall-bladder a useless step. Now if we could be sure that cholecystectomy would be harmless, then it might be perfectly proper for us to remove the gall-bladder, because it is perfectly proper from a surgical standpoint and from a pathologic standpoint to do useless things in surgery so long as one can be sure that these things are harmless. That the removal of the gall-bladder is not always a harmless step we have found illustrated in dozens and dozens of cases that come to us for treatment, and are very much worse after the removal of the gall-bladder than they were before, so that we have felt that their bad condition after operation is due to the removal of the gall-bladder. We may have been entirely right about that, or the removal of the gall-bladder may have had nothing to do with the postoperative condition, but so long as these people are under the impression that the operation was performed for the purpose of curing them of their troubles, and find that, instead of being cured, they are actually worse, it is not a far cry to imagine that they were made worse by the operation. Not a month passes but we encounter several cases in which the patient is very much worse after having had the gall-bladder removed.

Now there is a peculiar law that is generally applied to surgical work, especially during the last twenty or thirty years, which works out about like this: An operation is performed for some peculiar condition, and the general proposition is made this operation is going to cure these patients of all kinds of trouble. For instance, at one time removal of the ovaries, at another time suspension of the uterus, at another time removal of apparently healthy appendices, at another time suspension of the kidney—and now removal of the gall-bladder. All these operations are at first hailed as being able to cure all conditions, and then, when it is found that they do not cure these conditions, some other equally useless procedure is substituted. At the present time the removal of the gall-bladder holds that position, and only those

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Fig. 145.—4. The last gall-bladder stitch being applied. 5. The wound closed with horsehair and silkworm-gut stitches. The pack in the gall-bladder is seen in the upper part of the wound just above the first tension suture.

who see an enormous number of cases and see the number of cases in which the patient is very much worse after the operation will appreciate the situation. Within four or five years everybody will be getting these cases, and then the cry will go up against the removal of the gall-bladder as a routine operation.

We tampon the gall-bladder lightly with gauze and then we suture it to the peritoneum and transversalis fascia (Fig. 145, 4, 5). We permit this gauze to remain in the gall-bladder for from five days to a week.

After the operation is complete we wash out the stomach, because the examination of the gall-bladder has forced a lot of bile into the stomach. You observe as the stomach-tube is introduced into the stomach that a large quantity of bile is evacuated. We will wash out the stomach with hot water (110° F.) until the water returns perfectly clear without any bile stain. Should we leave this bile in the stomach the patient would undoubtedly have nausea. Washing out all this bile leaves the stomach perfectly clean and leaves the patient entirely free from nausea.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

A CASE OF MUSCULOSPIRAL PALSY TREATED BY NEUROPLASTY AND TENDON TRANSPLANTATION

Summary: Case history—fracture of humerus with laceration of musculospiral nerve and resultant wrist-drop; two unsuccessful operations—failure to identify and unite the nerve ends; neuroplasty with fat and fascial tube by Dr. Beck; transplantion of tendon of insertion of flexor carpi ulnaris into common extensor tendon; results.

THE case which I am going to demonstrate is of interest just now, when the restoration of nerves after injuries is being studied in a large number of cases during the war.

Almost innumerable are the instances reported in the war literature of suture of nerves after laceration by bullets, bayonets, and other destructive agencies. Many good results are reported even after a considerable period has elapsed between the time of injury and the time of repair.

The history of the case is as follows: A young man, age nineteen, working in a factory, fractured his right forearm by a fall. It was a spiral fracture which lacerated the musculospiral nerve. Immediate treatment consisted in approximation of the fragments by the factory physician. A few days afterward, however, the physician noticed paralysis of the musculospiral nerve, with typical wrist-drop, and decided upon open operation. This was done. The operation consisted in wiring of the fragments in good apposition and suture of the nerves. As far as the physician was able to judge, he had connected the lacerated ends. No result, as far as musculospiral nerve action was concerned, ensued. Two months later another surgeon opened the arm from an incision somewhat nearer to the median line and tried to find the severed ends of the nerves. By that time the bones had healed with very good callus. This surgeon was sure he had united the nerve ends, but no results had appeared five months later. Another operation was suggested.

At this time, seven months after the injury, with total paralysis, atrophy of the arm in the paralyzed muscles, the boy entered our service (Fig. 146). I shall read you the description of the operation which I performed at that time:

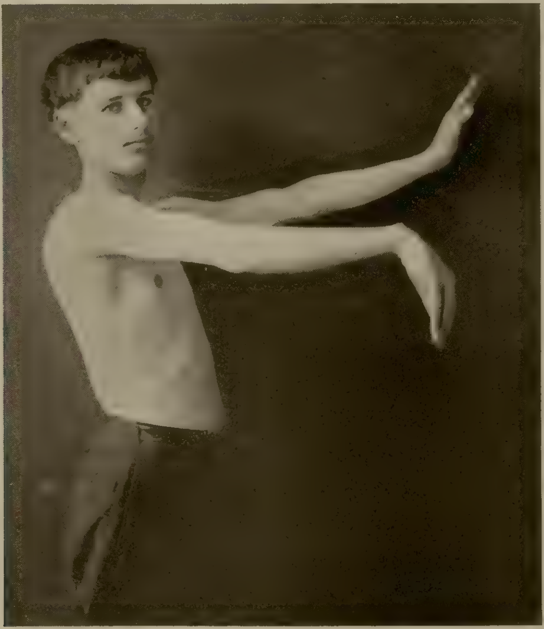

Fig. 146.—Wrist-drop in case of musculospiral palsy.

Incision made on the outside of the forearm, with excision of the scar of the first operation. The peripheral end of the nerve is easily found. It is adherent to a scar produced by the suturing of the nerve to some structure, which when dissected proves to be either fascia or some branch nerve, but not the proximal end of the musculospiral. A very minute dissection upward discloses a bunch of whitish, curled-up tissue, which looks at first like a fat globule, but later proves to be the proximal end of the musculospiral curled up and folded on itself. After it is unravelled it can be brought down so that its end, which has never been sutured before, lies in contact with the distal end when the arm is sharply flexed.

Two sutures of very fine silk are now introduced in the perineural structures, but not through the nerve. This is thought very important, inasmuch as sutures introduced through the nerve structure itself lead very easily to scar formation, which prevents the formation of the axis-cylinder offshoots in the healing together of such nerves. The distance between the ends is about $\frac{1}{16}$ to $\frac{1}{4}$ inch.

We now resect some fascia lata with fat and turn it into the form of a tubule over the sutured end of the nerve so as to form a conduit for nerve union. The muscle is then approximated over the united nerve, the arm is held in the highly flexed position, and the external wound closed.

It is expected that union of the nerve will take place and that the nerve will become physiologically active again, but to assure the patient of some success and give him some usefulness of his arm, even if such should not be the case, I decide immediately to associate this neuroplasty with the transplantation of a muscle from the active group of flexors into the paralyzed extensors. I use the flexor carpi ulnaris. The incision is made from the os pisiforme alongside the tendon of the flexor. The flexor is then cut off transversely below the pisiform bone. A second incision is made on the dorsal surface of the forearm, beginning below the transverse ligament of the wrist, and the common extensor tendons are exposed, raised with a forceps, and a channel made toward the ulna underneath the skin; the free end of the flexor grasped and drawn through the channel. It is then sutured, while the hand is held sharply extended, to the extensor tendons, and in this position the arm is kept in a plaster cast for three weeks (Fig. 147).

Three weeks later the plaster cast was removed and first passive and then active motions were made with the arm. It is now ascertained that the patient can move his hand with the aid of his transplanted flexor through an arc of about 15 degrees, and, when he closes his hand, through almost the normal range of motion. The fingers cannot be raised, however, from a flexed position. Thus the patient had been given some extensor motion, which, of course, was all due to the transplanted flexor muscle.

Massage and faradic currents were now used daily on the arm, and active movements were attempted by the patient, and within two weeks the fingers showed evidences of return of extensor power. The musculospiral nerve showed beginning activity, and sensation had returned.

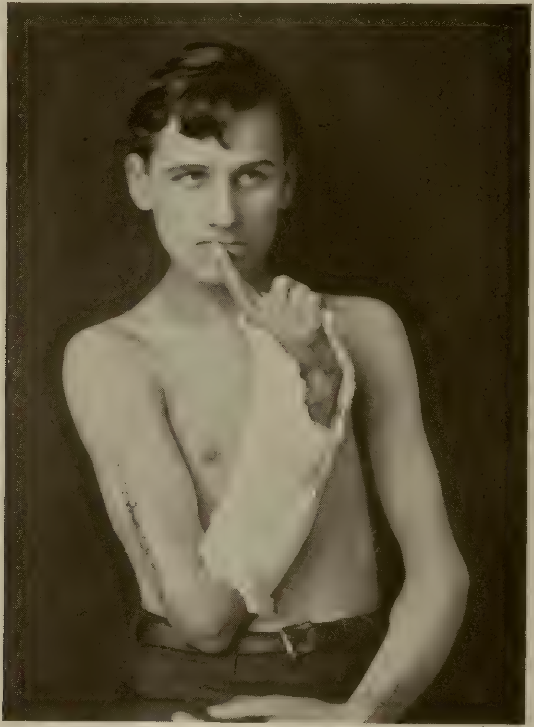

Fig. 147.—After operation of neuroplasty and tendon transplantation—hand dressed in marked extension.

The patient can now hold his hand, even with the arm extended at a right angle, in line with his arm, while formerly he had absolutely no such power, even with the aid of the transplanted flexor muscle. It is now twelve weeks since my operation, and considerable improvement is noticeable (Fig. 148).

From the literature and from former experience we know that considerable time may elapse before active motion of the muscles begins, but that in a large proportion of the cases the activity of the muscles in response to stimuli transmitted through the reconstructed nerve returns. Neuroplasty through a tubule, therefore, an old and well-known procedure, is a perfect success. It is important that the tube is such that contraction does not take place. In former times I used to wrap the nerve, after suture, into the muscle substance itself. I frequently used fat alone, but in the last few instances of neuroplastic operations I have made especially good use of a flap of fascia and fat. This can be very easily obtained from the fascia lata, with uniformly good success.

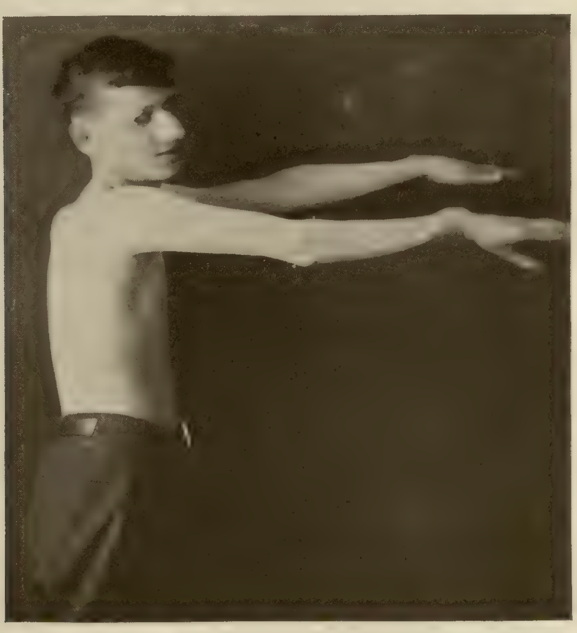

Fig. 148.—Result twelve weeks after operation. Compare with preoperative condition shown in Fig. 146.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

SALIVARY CALCULI

Summary: Signs and symptoms, etiology, and complications of salivary calculi; the diagnosis; treatment; repair of salivary fistulæ; effect of prolonged x-ray treatment on glandular secreting activity.

November 28, 1917.

I WANT to show you a very interesting case this morning in which the diagnosis is somewhat difficult of explanation. This patient is a man of about forty. He comes to us with a swelling about as large as an egg under the angle of the jaw on the right side in the position of the submaxillary gland. This swelling has existed for about six months. It is very hard and not very painful and has been diagnosed as carcinoma. There are, however, some other pieces of evidence that make me question this diagnosis and make me hopeful that it is not a carcinoma, but a chronic inflammation of the submaxillary gland associated with stone formation in the ducts. These pieces of information are three in number:

First: The patient has noticed, on several occasions, small grit-like masses come out, apparently, from the submaxillary duct into the mouth. Second: he has very distinctly noticed pus at times pouring into the mouth from the opening of the submaxillary duct. Third: he has, especially when the process was in its early stages, noticed rather definite increases, and then diminutions, in size, occurring fairly rapidly, in this mass.

The man's general health is good and I have given him the hopeful side of the case, namely, that the lesion from which he suffers is probably a chronic inflammatory process with calculi and not a carcinoma.

I shall do this operation under local anesthesia and shall use the new American product, apothesin, which we are using in just the same way that we formerly used novocain, that is, $\frac{1}{2}$ of 1 per cent. solution in sterile water, heated to the boiling-point, and then cooled, with 1 : 100,000 adrenalin. After infiltrating the skin and superficial fascia I make a curved incision just under the ramus of the jaw so as to avoid injury to the facial nerve. I divide through the skin, superficial fascia and platysma, and the deep cervical fascia covering the submaxillary gland. The tissues are edematous and infiltrated and, I must say, suggestive of a malignant process. I am raising up, as you see, a large flap exposing the submaxillary gland. I now infiltrate the deeper part of the fat with apothesin, and with very great difficulty I am isolating the gland from the surrounding tissues. At the upper part of the dissection there are several enlarged lymphatics which are also suspicious of carcinoma, and the gland is embedded in edematous connective tissue, making the dissection extremely difficult, and it makes one think of a mass of tissue that has been embedded in paraffin or plaster of Paris. It is necessary to

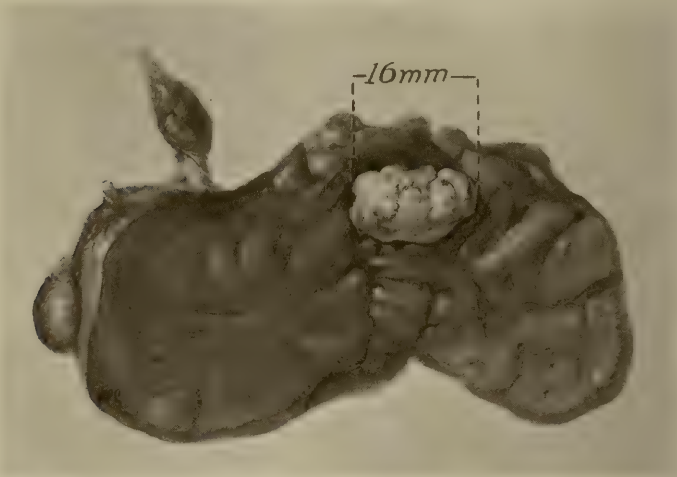

Fig. 149.—Sketch of gross specimen showing large calculus entirely occluding submaxillary duct.

ligate the facial artery and facial vein in the dissection, and I have exposed the hypoglossal nerve in the bottom of the wound. I am now completing the dissection, and find that the mass of tissue extends from the main gland up into the floor of the mouth. The mylohyoid and hyoglossus muscles around it are infiltrated and edematous, and I finally succeed in removing the entire gland in one piece.

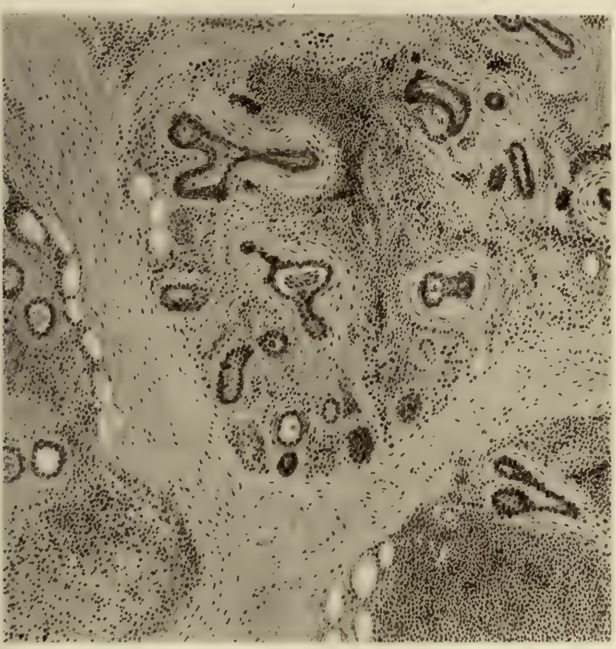

Fig. 150.—Drawing of section (16 mm. objective) from gross specimen shown in Fig. 149. Note round-cell infiltration and fibrosis of gland and absence of evidences of carcinoma.

I shall cut this specimen open, and as I cut it the knife grates like it does in dividing carcinoma of the breast. As I extend the section, however, you see I expose to view in that portion of the gland which projected toward the mouth a large yellowish salivary stone the size of the end of my index-finger, which is in the main submaxillary duct (Fig. 149), and a number of small calculi projecting into the branches that go to form the main duct.

There are two possibilities in this case from this examination of the gross specimen, one that we have an inflammatory process, pure and simple, with salivary calculi, and another, that this may be a case of carcinoma of the submaxillary gland associated with stone formation. I have seen a parallel condition in the kidney, namely, carcinoma of the kidney with kidney stone.

The operation has been tedious and prolonged, and yet the patient has stood the ordeal very well—I think, on the whole, better under local than if it had been done under general anesthesia—although if I had known the difficulties of the dissection beforehand I think I should have preferred a general anesthetic.

Postscript.—The microscopic examination of the specimen showed chronic inflammation of the submaxillary gland with round-celled infiltration (Fig. 150); careful examination of sections taken from several parts of the gland failed to show any evidence of carcinoma.

I should like to use this case as a text and say a few words about salivary calculi and the operations that we have recently done on the salivary ducts. Salivary calculi are comparatively rare, but at the same time, in a large hospital experience, they occur not infrequently. We have had on our service probably 20 or more of these cases. The condition is so infrequent, however, that it is not, as a rule, recognized by the general practitioner. The pathology of this condition is the same as that of gall-stones or kidney stones, the formation of the calculi being the result of stone-bearing catarrh of the mucosa of the salivary ducts, this stone-bearing catarrh leading to the formation of nuclei or masses of mucus, pus, or blood, and around these nuclei the salts from the saliva are deposited. In addition, I am quite sure that foreign bodies not infrequently act as nuclei of these salivary stones. Small pieces of oyster shells or food particles that are forced into the open-mouthed duct during the process of mastication may become the nuclei of salivary stones. I have seen a number of these cases where the stones were accidentally discovered and where they gave rise to no symptoms whatever. One of my medical colleagues has known for years that he has a salivary stone in one of his submaxillary ducts. He can feel it very distinctly. It has never given rise to any trouble, and he has not thought it necessary to have it removed by operation. The common picture, however, of salivary stone is that of obstruction of the duct with sudden swelling of the duct, especially during meals, and sometimes definitely occurring after eating some slightly acid substance, like a pickle, which stimulates the rapid flow of saliva. Sometimes these obstructions are exceedingly painful. As a rule, they are transitory, the saliva gradually working past the obstructing stone into the mouth, relieving the tension with subsidence of the swelling. Sometimes, however, the swelling is more persistent and is associated not only with obstruction of the salivary duct, but with evidences of infection of the submaxillary ducts, such as the evacuation of pus from the duct or the development of a tender, painful swelling due to extension of the infection to the gland tissue itself, and in some cases with definite abscess formation in the glands, leading to the necessity of drainage either through the mouth or under the jaw. This symptom-complex, if once seen, is, as a rule, readily recognized in the next case encountered.

The diagnosis is, as a rule, confirmed in the simple type of case by feeling the presence of stone in the duct. Not infrequently the patient has discovered this fact, and will call the attention of the surgeon to the presence of a hard body in the floor of the mouth, which on examination proves to be a salivary stone. When a stone is located in the submaxillary duct without associated infection, the treatment is very simple and comparatively easy. It consists in the removal of the stone through an incision in the duct. The operation should be done under local anesthesia, either with a solution of novocain or apothesin, to which has been added a fair amount of adrenalin; the adrenalin is useful in that it tends to cause the blood-vessels to contract, and thus makes the mucous membrane temporarily relatively avascular. A direct incision is made over the stone through the mucous membrane of the mouth and wall of the duct and the stone removed. In such a case as the one that we have just operated upon the mere removal of the stone would probably not cure the patient. There has been such a long-standing inflammation of the duct

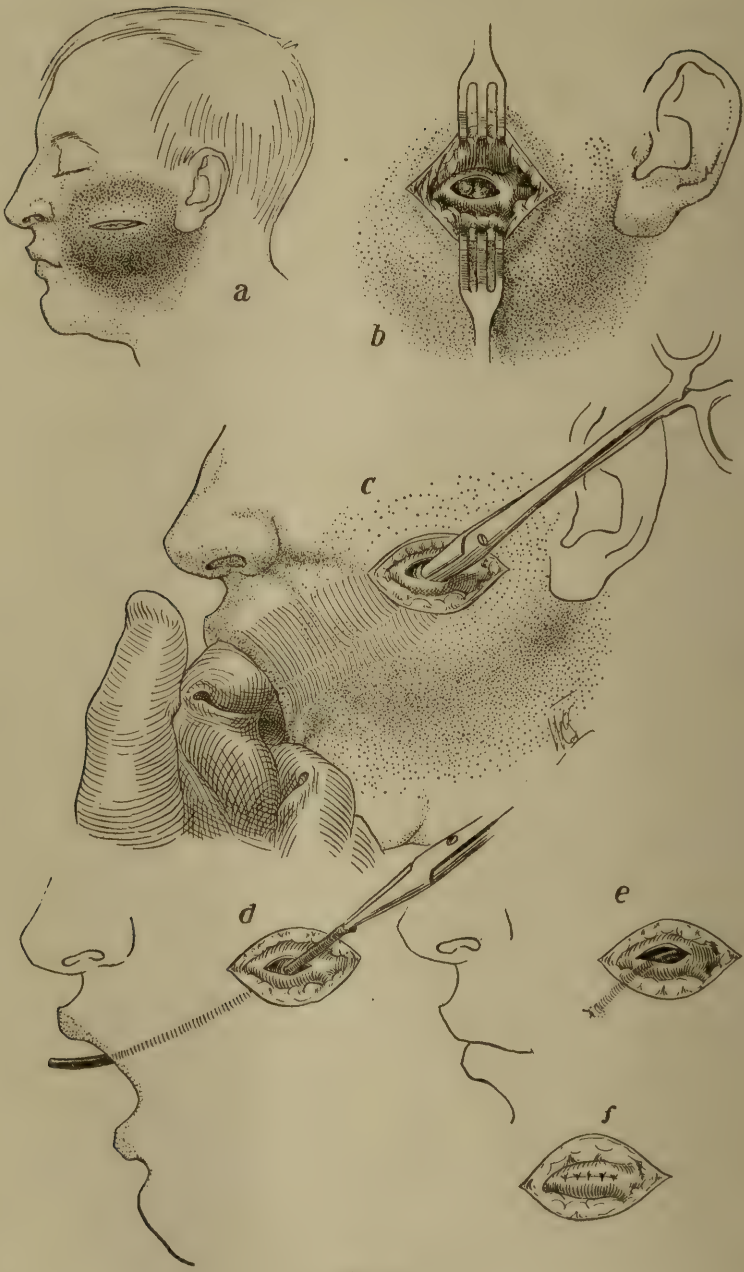

Fig. 151.

that recurrence of the stone would be probable and the continued suppuration from the duct would probably continue even though the stone were successfully removed. In this respect these cases are very similar to those cases of kidney stones in which there are movable stones filling the pelvis and calices with associated extensive destructive processes in the secreting structure of the kidney tissue; in such cases, from long experience, we have learned that removal of the entire kidney with the stones is preferable to simply removing the stones themselves, because there is such a great probability of failure to cure if the injured kidney is allowed to remain, even though the stones are completely removed.

In most of our cases of salivary stones the calculi have been in the submaxillary duct. We have, however, had a few cases in which the stones were located in the parotid ducts; in one such case which came to our service two months ago there was an abscess of the parotid gland just ready to break on the face. There had been considerable pain associated with an inflammatory swelling of the parotid gland following a rather typical history of long-standing obstruction of the salivary gland from stone occurring intermittently. In this case I cut down directly into the abscess through the tissues of the cheek from without, opened the abscess, removed the stone, and then took a small catheter, about No. 8, and introduced it into the dilated pocket of the duct from which we had removed the stone, and then carried it through an opening which I made in the mucous membrane of the mouth with a pair of closed artery forceps, stitched it in this position, and cut off the tube inside of the mouth, so as to leave projecting into the mouth simply a short part of the tube, about $\frac{1}{16}$ inch. I then closed the external incision with fine silk sutures. Fortunately, we succeeded in obtaining an admirable result in this case, and I shall draw on the board these diagrams illustrating the steps of the operation (Fig. 151).

Fig. 151.—Case of abscess secondary to obstruction of parotid duct by calculus; steps in the operation for the removal of the calculus and repair or reconstruction of the duct.

The other case involving the parotid duct which we have recently had under observation was extremely interesting. It was in a patient, a man of about fifty, who had had a slowly developing rodent ulcer of his cheek for six or eight years. The disease eventually ate into the parotid duct and produced a salivary fistula. He was then treated by some very good *x*-ray man for the rodent ulcer. He was referred to me by the *x*-ray expert, who believed at that time that the malignant process had been entirely obliterated, and I was requested to restore the submaxillary duct.

Under local anesthesia I dissected down to the duct, introduced a small rubber tube into the proximal end of the duct, and made another opening with a closed pair of artery forceps into the mouth, and carried the tube into the mouth. I then dissected the old fistulous tract on the skin and closed the skin incision completely with suture. Unfortunately, the wound did not get well. Examination of the fistulous tract which I removed showed that the rodent ulcer—a basal-celled epithelioma as proved by microscopic examination of section—had not been cured, but still persisted. However, part of our operation was successful in turning the flow of saliva into the mouth and relieving the salivary fistula. Later, however, there was recurrence of the rodent ulcer. It was handled for a long period of time with *x*-ray. Finally, however, the tumor ulcerated its way through the tissues of the cheek, producing a large opening the size of a quarter, out of which saliva poured, and which made it difficult for the patient to eat without losing a good deal of food through this opening. The patient persisted in using the *x*-ray for a long period, but finally he returned to me. I advised an extensive plastic, taking out the epithelioma widely and dividing part of the masseter muscles, which were so contracted by the disease process as to produce almost complete closure of the jaws, and then close the defect with a large flap taken from the skin and superficial fascia of the neck. This was done within the last few months, and I have seen the patient recently. There is no evidence of recurrence and the plastic has given a really ideal result.

An interesting condition developed in this case: Owing, I believe, entirely to the long-continued use of the *x*-ray, the parotid gland has been destroyed as a secreting organ, because although the destructive process must have destroyed the parotid duct which I had repaired, there has been no return of the salivary fistula since the last operation. This is in keeping with what we might expect from long-continued use of the *x*-ray in cases of this kind.

CARCINOMA OF STOMACH—PYLORECTOMY

Summary: Historical sketch—the work of Péan and of Billroth; cure of gastric cancer—early diagnosis indispensable; the three objects of operation: exploration, palliation, cure; diagnostic data in present case; preoperative care; technic of pylorectomy; after-management.

December 5, 1917.

I DESIRE to discuss with you this morning the subject of carcinoma of the stomach, and to operate upon a case in which the clinical diagnosis of carcinoma at the pylorus has been made and where the evidence obtained suggests conditions which will probably make it possible for us to do a radical resection.

The history of surgical operations for carcinoma of the stomach begins with the first case operated on in 1879 by Péan, of Paris. Péan conceived a proper technic of procedure, but, unfortunately, his patient died. The first successful case was operated on by Billroth in 1880. It is very interesting in reviewing Billroth's work and the work of the surgeon of today to see how fully Billroth understood the surgical problem involved, and to find that he at once developed a surgical technic with such perfect mastery of details that it has practically not been changed from that time until today. I was fortunate in having an opportunity of studying in Billroth's clinic for a few months in 1892–93, and to hear the great master of stomach surgery discuss this subject and present several cases which he had operated upon some years before. Several of these showed no evidence of recurrence. One was an unusual case, which showed a late recurrence eight or ten years after operation. Billroth devised two different methods of resecting the stomach at the pylorus. One, known as Billroth No. I, in which, after resection of the pylorus, he united the cut end of the stomach to the duodenum; and the other, known as Billroth No. II, in which he closed the end of the stomach and duodenum and made a gastro-enterostomy. The Billroth No. II operation was thought to be indicated where a wider removal of tissue was required. This operation, the Billroth No. II, is the operation which may today be regarded as the standard procedure. Billroth, in his stomach resections, used three rows of sutures, one through the mucosa, the second through the muscularis and peritoneum, and the third, a Lembert suture. Many attempts have been made to improve this simple and efficient method, and yet I believe the suture method introduced by Billroth remains today the best method that has been introduced, and we have for years employed it in our clinic.

Carcinoma of the stomach is one of the commonest forms of carcinoma that the medical man and surgeon have to deal with. The lesion, as a rule, is first seen by the general practitioner or by the internist, as the early symptoms are frequently vague, and neither the patient nor his physician are apt to consider surgical consultation desirable. Carcinoma of the stomach, however, is just as truly a surgical condition as is carcinoma of the breast, because the only hope of relief the patient has is afforded by surgical procedures. Unfortunately, many of these cases are carried along for weeks and months without being recognized, and when the surgeon is consulted the process has gone so far that radical operation is out of the question. In our experience the favorable cases are those in which the carcinoma is situated at the pylorus and produces early and definite symptoms of obstruction. Where the carcinoma is situated in the body of the stomach it, as a rule, does not give definite evidence of its presence until it has grown to such a size and produced such extensive local and even general involvement that no radical removal can be made.

Carcinoma of the stomach could be cured with just as much certainty as carcinoma of the breast or epithelioma of the lower lip if we could discover it as early as we are often able to do in the breast and lip cases. The one great problem that confronts the physician and surgeon today in carcinoma of the stomach is the problem of diagnosis, and especially the problem of early diagnosis, diagnosis at a time when radical removal of the lesion is still feasible. The *x*-ray has thrown a good deal of light on this subject within the last few years, and has often given us definite evidence of the existence of carcinoma by the demonstration of filling defects which, with the other evidence obtained, has made it possible to arrive at a clinical diagnosis of early carcinoma with a fair degree of probability. A definite and absolute demonstration that the stomach lesion is carcinomatous cannot be made in many cases except by actual operation and microscopic examination. We find, as we analyze the cases as they come to the clinic, that the surgeon at the time of operation can do one of three things: first, radical resection of the lesion; second, the palliative operation of gastro-enterostomy, especially indicated where radical resection is out of the question and there is an early obstruction at the pylorus or conditions present which will later develop into obstruction at that point; third, exploration only. This procedure is indicated in a group of cases where the lesion is found so extensive that radical operation cannot be made and where there is no fair indication for the palliative operation of gastro-enterostomy.

Our diagnostic ability and our surgical technic for handling these stomach carcinomas have greatly improved within the last ten or fifteen years. What results are surgeons today obtaining in these cases? In cases in which the radical operation is indicated and carried out the associated mortality is reasonably small, from 10 to 20 per cent., varying in different series of cases. Probably 25 per cent. of these cases are still without evidence of recurrence at the end of three years; 50 per cent. or more are greatly relieved by the radical operation for periods varying from one to three years or more, and then die of recurrence or of some intercurrent disease. In other words, one can say with assurance that 75 per cent. of the cases in which resection can be made are either cured or very greatly benefited by surgical therapy. This is in striking contrast to the history of cases of this type if they are not given the benefit of surgical operation. Nothing is more distressing than death from carcinoma of the stomach. The distress from the pyloric obstruction, the pain, the starvation, the loss of weight and strength, gradually creeping along through weeks or months of misery, all go to make a very distressing picture. In cases in which at the time of operation radical removal is found impossible and there is obstruction at

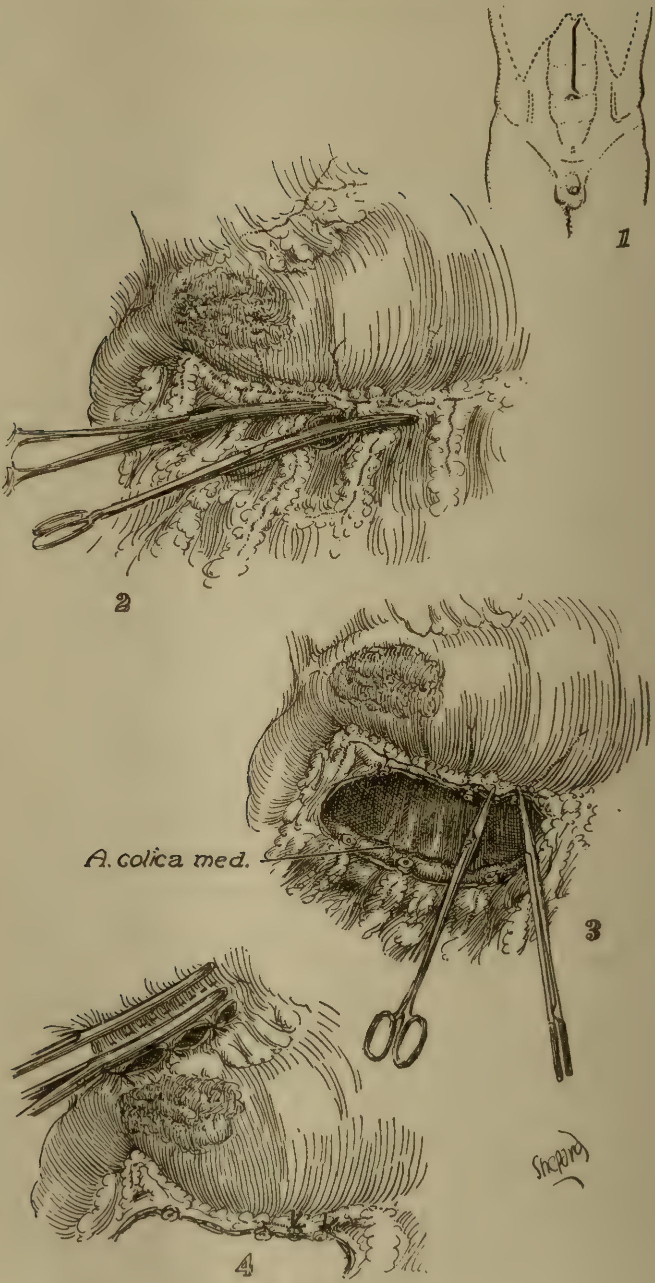

Fig. 152.

the pylorus, gastro-enterostomy should be done. In many cases this gives very great relief for a considerable period. As a rule, however, this palliation does not extend over a period exceeding six to twelve months, and is then followed by wide-spread regional involvement, general carcinomatosis, and sometimes with recurrence of the obstructive symptoms. The palliation obtained by gastro-enterostomy in these cases is not nearly as great or prolonged as that obtained by radical operation.

This patient is a man of sixty, who has been under the care of Dr. Sippy for several weeks. A clinical diagnosis of carcinoma at the pylorus has been made. The evidence is that of stomach distress, pyloric obstruction, absence of free hydrochloric acid, presence of Opper-Boas bacilli, and loss of weight and strength. Screening of the stomach shows a distinct filling defect at the pylorus. The hemoglobin has been reduced to about 45 per cent.

I shall do this operation under drop ether, which is given by Dr. Herb. The patient has been prepared by having his stomach washed out about an hour ago, and for the last forty-eight hours he has been given plenty of liquids. I now make a midline incision between the ensiform and the umbilicus. I want to call your attention to the fact that I make the incision a little to the left of the ensiform cartilage and then come down in the midline, and then a little to the left of the umbilicus, so that if necessary to enlarge the incision I can do so readily without interfering with the round ligament of the liver (Fig. 152, 1). Exposing the peritoneal cavity, I come down to the rather large but normal lobe of the liver in front of the stomach, extending down halfway between the ensiform and the umbilicus. Lifting the stomach into view, I find a tumor at the pylorus from 1½ to 2 inches wide. This involves the lesser curvature close to the pylorus. The duodenum, as is usual, is free from carcinoma, although the car-

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Fig. 152.—1. Midline incision from ensiform to umbilicus; note curve to left at umbilicus. 2, 3, 4. Isolation of tumor-bearing portion of stomach preliminary to resection. Note puckering of serosa due to the cancerous infiltration and the sharp limitation of the neoplasm at the gastroduodenal junction. The two forceps shown in 3 are applied to the artery gastro-epiploica dextra. The site of division of the gastrohepatic omentum is also indicated (4).

cinoma comes up to the pylorus itself. There are a few small glands at the lesser curvature which are somewhat enlarged and hard and probably carcinomatous, but the whole mass is quite freely movable and is not bound down to the pancreas, and I think conditions favorable not only for resection but for ultimate cure.

The first step of the operation is the separation of the omentum extending between the stomach and transverse colon. As I do this I ligate the vessels at two points and divide between. I ligate with catgut. It requires, as you see, seven or eight ligatures on the stomach side and on the colon side to make a wide separation of the transverse colon from the greater curvature of the stomach and duodenum. This exposes freely the lesser peritoneal cavity (Fig. 152, 2, 3). In doing this step of the operation I find here a large artery (the colica media) which runs from the superior mesenteric artery to the colon in close contact with the field of operation, and if I had not known of its existence and taken steps to avoid it I would have ligated this main blood-supply of the transverse colon and probably killed the patient because of the gangrene of a large part of the transverse colon, which would have resulted. This is a point in the operation which should be especially borne in mind. Now in the same way I ligate the gastrohepatic omentum for a distance of 4 or 5 inches, freeing completely the lesser curvature of the stomach and the upper border of the duodenum (Fig. 152, 4). I have now mobilized very fully and completely this tumor mass, so that I can bring it well out of the wound. I pack a large abdominal pad in the lesser peritoneal cavity and beneath the stomach and duodenum. I now apply a large stomach clamp protected with rubber tubing to the stomach at about the junction of the lower and middle thirds of the viscus. An inch to the right of this I now apply a massive crushing clamp and cut through the stomach between these clamps, protecting the mucous membranes exposed by gauze pads. Then, as you see, I close the end of the stomach by three rows of sutures, one through the mucosa, one through the peritoneum and muscularis, and the third a definite Lembert suture. You will notice that I have ligated the large arteries close to the stomach at the lesser curvature and at the greater curvature. I have ligated these with fine catgut (Fig. 153, 5–8). The stomach is now completely closed. I now separate the duodenum down to the pancreas and completely mobilize it for a distance of about 2 inches from the pylorus. I take this large crushing clamp and crush the duodenum just behind the pylorus. I remove the clamps and ligate the duodenum here with a silk ligature (Fig. 153, 9). I then cut off the duodenum about $\frac{1}{4}$ inch to the stomach side of the ligature and remove this entire mass. I shall ask Dr. Sippy to cut open the specimen and demonstrate the gross appearance.

As you see, there is a large carcinomatous ulcer in the interior of the stomach with carcinomatous infiltration of all layers of the gastric wall. On the stomach side you see that I am quite wide of the carcinoma, at least 2 inches. On the duodenal side I am in quite close contact with the carcinoma, which extends up to the pylorus. The handling of the stump of the duodenum has been to me one of the most difficult and complicating problems in these operations. Frequently it is difficult to mobilize so as to make it possible to secure a good closure. In this case I put in a purse-string suture about 1 inch from the point of the ligature and invaginate the stump of the duodenum (Fig. 153, 10, 11). You see I have a little difficulty in placing the stump inside of my purse-string. I now have a very complete closure of the duodenal end. Another method which I have employed is suturing up the end of the duodenum by two or three rows of sutures. I am really uncertain in my own mind as to which is the best method of procedure. I do know, however, that complete closure of this duodenal stump without leakage is one of the most important parts of the operation, and of late years we have never failed to carry a small cigarette drain through the external wound down to this point of closure, leaving it in twenty-four or forty-eight hours to provide against leakage.

The remaining step of the operation is a gastrojejunostomy with rapid suture. It is really immaterial whether you do an anterior gastro-enterostomy or a posterior. I have not been able to see much difference in the end-results, and in this case

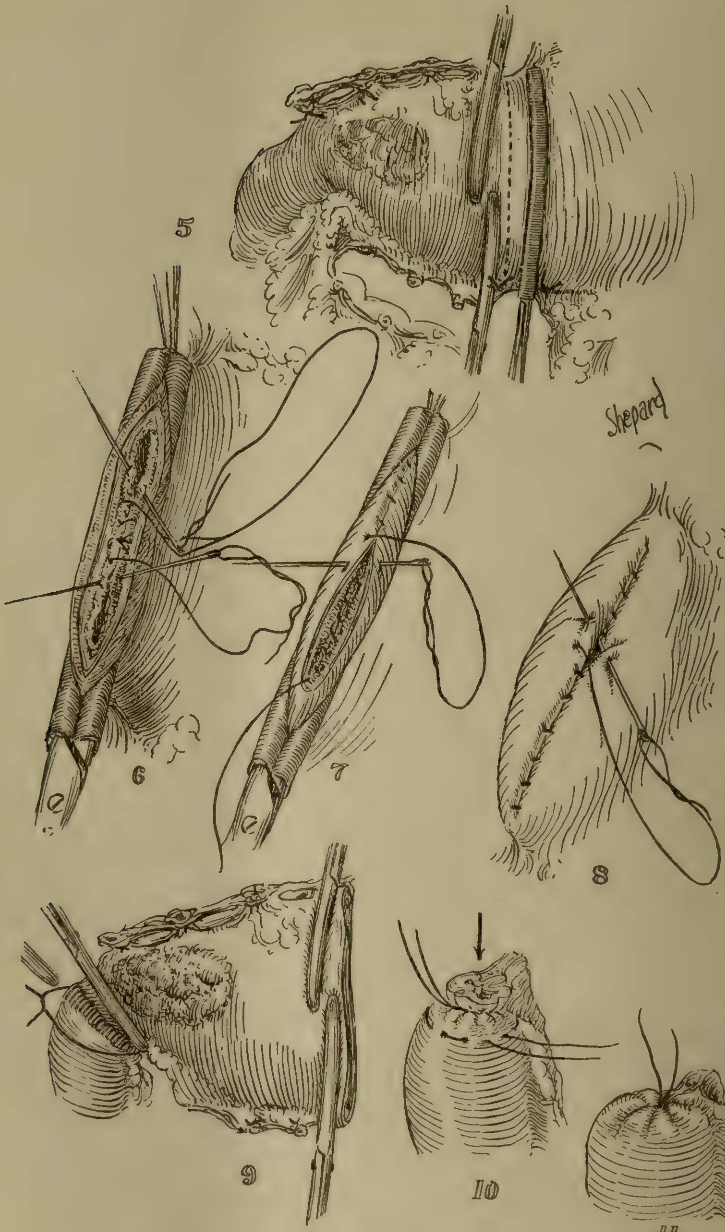

Fig. 153.

I shall do an anterior gastro-enterostomy, which we can do with a very short loop of the jejunum rapidly because we have so fully mobilized the stomach by resection. The gastro-enterostomy we do with three rows of sutures, making an opening about $1\frac{3}{4}$ inches in length between the stomach and jejunum. The external wound is now closed and I am doing here what I believe is wise in addition to the ordinary suturing. I am putting in two large mattress sutures of silkworm-gut as tension sutures, tying them over a small piece of cigarette drain about 1 inch in length and very much as years ago surgeons employed the quilted suture. The reason for doing this in these cases is that because of the low vitality of these patients—this patient having but 45 per cent. hemoglobin and being very much undernourished—wound repair is much slower and less complete than in patients who are in good general condition. One cannot safely remove the stitches early, because if you remove the stitches at the end of eight or ten days not infrequently the wound opens up, because wound repair is not yet sufficiently complete to withstand the intra-abdominal strain. On that account I remove the skin sutures and particularly the silkworm-gut sutures at the end of ten days, but leave the two mattress tension sutures in for a longer period—twelve days and sometimes as long as fifteen days—until I am satisfied that wound repair is complete.

Another point is this: I like to get these patients sitting up early, and I feel more comfortable in doing this with a couple of mattress tension sutures protecting the incision than I would if the incision were closed in the ordinary way.

The after-management in these cases in our service is quite simple. For the first twenty-four hours we give the patient

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Fig. 153.—The artery gastro-epiploica dextra (5) is divided between the forceps and ligated, and then the large gastric clamp applied between the divided ends. This step contributes materially to the ease and safety of the operation. 6, 7, 8. Site for division of stomach under control of forceps. Closure of cardiac end after division by the Billroth three-layer method. 9, 10, 11. The gastroduodenal junction is grasped by means of two crushing clamps; the lower clamp is then removed and a silk ligature applied snugly in its stead. The tissues are then divided between the ligature and the remaining clamp, after which the duodenal stump is invaginated by purse-string sutures.

10 to 12 ounces of normal salt solution by rectum every three or four hours and nothing by mouth. After the first twenty-four hours, however, we begin giving the patient 1 ounce of water each hour by mouth, and if this is retained without distress, we then begin with milk and water, milk and cream and broth, and within three or four days are giving the patient thin gruels, and gradually increase the diet so that at the end of a week the patient is on a soft tray, and at the end of ten or fifteen days on a full tray. The patients are allowed, if they are able to do so, to sit up on back-rest within forty-eight or seventy-two hours, and to sit up in a chair in five, six, or seven days. There seems to be less likelihood of the development of hypostatic pneumonia and of lung complications where we are able to get these patients up early.

Postscript.—The microscopic examination of the gross specimen showed carcinoma and also carcinoma of the lymphatic glands at the greater curvature. The patient made a good operative recovery, and the case is one in which there is a very fair prospect of cure. We have had a number of these cases live without recurrence for three, five, and eight years after operation, and one cannot help but be tremendously impressed by such recoveries, knowing what would have resulted inevitably in these cases had not the carcinoma been radically removed.

CLINIC OF DR. JOSEPH BRENNEMANN

ST. LUKE'S HOSPITAL

(GIVEN FOR THE SURGICAL CONGRESS, OCTOBER 24, 1917.)

CASE OF RAT-BITE FEVER

Summary: A patient presenting a peculiar train of symptoms following a bite by a weasel; diagnosis of rat-bite fever; etiology—a spirochete or a streptothrix; salvarsan supposedly curative.

October 24, 1917.

THIS child presents an unusual and rather rare condition. This boy has a sepsis of a peculiar type. Two days ago he had a temperature of 106° F. and was very very sick. Four days from now he will again have a high temperature and be very sick. I feel quite positive in being able to say so. He is at present perfectly well and has had a normal temperature—perhaps a little subnormal—for forty-eight hours. What sort of a condition could produce that type of sepsis? On the 19th of August this boy was playing in one of the parks with three or four other boys when they discovered a weasel. They went after it with sticks and finally cornered it, but the weasel bit this boy on both hands, where you see this dark discoloration. The wounds were treated immediately by a druggist before taking him to a doctor, who thoroughly cauterized them. The boy did not feel very well for the next week or two. At the end of two weeks both the places that had been bitten began to swell up. The hand on the right side swelled up to fully twice the normal size, and the hand on the left side also swelled up. He had very little pain, no redness. The hands were simply very much swollen, with a rather dark red discoloration. He had a temperature of 104.5° F. and was quite sick. The epitrochlear glands on both sides were distinctly enlarged and the cervical glands were distinctly enlarged. He had a peculiar mottled rash on his body. Two days later he was all right. At the end of four or five days he had a high temperature again. I saw him at the dispensary, and after the second attack brought him into the hospital to have him under careful observation during the time he went through this course. He will have two days of high temperature, usually 105° F.; within twelve hours it is down to normal, remains practically normal for four days, and then goes up again. This time it came down rather slowly. That condition will probably keep on.

There are two things that will cause such a condition, one is relapsing fever and the other is rat-bite fever. The clinical course of rat-bite fever is exactly the same as this. The symptoms appear sometimes in a month, but usually at the end of two weeks. There is usually not much pain and not much redness locally. The glands that drain the region bitten are involved and the patient has a high temperature. They quite commonly with some attacks have a distinct erythematous eruption. This child with two attacks has had quite a marked eruption over the face and sometimes over the other parts of the body, which looks very much like ringworm, but is very transient. The typical thing in the course is that there is never any suppuration, and that you have a distinctly relapsing fever as distinct as with relapsing fever itself. There is so distinct a periodicity that you can definitely say that on such and such day he will have the fever. One case is reported in which there were twenty-six such relapsing attacks. These attacks may go on for years. The usual interval between them is from four to five days. In a good many of these cases they apparently have relapses once or twice a year. There is a case on record in which fifteen years after the original infection the patient every year had one of these febrile attacks.

The prognosis is good, about 10 per cent. mortality. The greatest mortality is in the first attack. The rest of the course probably depends to some extent upon the treatment, though the mortality is probably not over 10 per cent. We ordinarily expect these cases to get well in a short time.

The interesting work that has been done has been chiefly in regard to the etiology. There are two different ideas in regard to it. The Japanese have done the most of the work. There have been more cases in Japan than anywhere else. They have isolated a spirochete and the disease has been transmitted to guinea-pigs. It is quite common for a rat that will transmit the disease to one person also to transmit it to another. The organism has been found in the salivary glands. The spirochete is the organism which is probably more commonly accepted as being the etiologic factor. On the other hand, Schottmüller, in Germany, and Blake, in this country, have each had cases in which they found a streptothrix which could be distinctly demonstrated in people, while the spirochete could not be demonstrated. This streptothrix is not transmitted to guinea-pigs. Of course the organism that causes rat-bite fever in Japan may not cause it here. There have been only 80 cases reported in the literature. In this case we have found nothing. The laboratory is working on it, but no definite results have been obtained.

The other boys did not get the infection. The interesting thing about these cases is that in many of them one gets a positive Wassermann reaction. I think in this case, since there is a history of five miscarriages, there is a probability of a leutic basis, and this may account for the positive Wassermann here. There is no other reason to think the boy himself has it. The mother likewise gives a positive reaction. Salvarsan is supposed to be markedly curative. In this case it is doubly indicated and will be given.

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SURGICAL CLINICS OF CHICAGO

Volume 2 Number 3

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

RENAL CALCULUS AND GALL-STONES: REMOVAL THROUGH RIGHT LUMBAR INCISION; DIETETIC TREATMENT OF RENAL CALCULI.

History.—The patient, a married woman of seventy-six years, was admitted to the hospital September 10, 1917, because of an attack of pain in the right side of the back and flanks.

Her father died at eighty-one of apoplexy; the family history is otherwise negative. She had measles when a child. Has always been healthy. Menstruation began at sixteen. She had the menopause at fifty-two, with no complications. She has been married fifty years. She has had eight children, six of whom are living. She had no miscarriages.

Her appetite is good and she sleeps fairly well. Bowels are constipated. She drinks three cups of coffee a day.

Twenty-three years ago she began to have attacks of pain in the right lumbar region. In the past year she has had several attacks. These attacks begin suddenly, most frequently at night, with agonizing pain in the right lower abdomen, radiating to the hip and right leg. She has to have morphin several times in a day to relieve the pain during the attacks. She has never noticed blood in the urine. Since the last attack in July she has not been free from pain, which has the character of a constant dull ache. She does not vomit during the attacks. Six years ago she had an attack of pain in the left side. A doctor took an *x*-ray and told her that she had a stone in the left kidney. The left side has given her no trouble lately.

At 6 P. M., September 10, 1917, she was taken to the examining room and examined by an intern. Just after the physical examination she had an attack of severe pain in the right side of the abdomen at a point just below the rib margin in the axillary line.

Physical Examination.—The patient is a well-developed, moderately obese, elderly woman, with good color and clear skin. All the upper teeth are missing; and the few lower teeth that are left are in good condition. Neck, chest, heart, and lungs are negative. There is moderate tenderness without spasm on deep palpation over both flanks in the kidney regions. The uterus is moderately prolapsed. There is a marked cystocele and a moderate rectocele. There are three external hemorrhoids.

COMMENTS

Dr. Ochsner (September 13, 1917): We have an *x*-ray picture here which shows a shadow about 2 cm. in its greatest diameter and $1\frac{1}{2}$ cm. in its lesser diameter. You notice that it is located just beneath the margin of the last rib on the right side, showing that if it represents a renal calculus, said calculus must be located in the upper end of the pelvis of the kidney. It is somewhat irregular in shape. You would consequently conclude that with a stone of this size and with this form we would probably find a stone with the surface composed of phosphatic salts, no matter what the center of the stone might be. The character of the pain is exactly in keeping with the history. It is a dull pain, which is not the pain of a stone that is loose in the pelvis. The fact that there has never been blood in the urine would also confirm this. It is the small stone that gives rise to the severe pain, especially when the patient is shaken up from riding in a buggy or an automobile or is jarred in any way. Then you will look for a small stone that changes its position in the pelvis. This stone has not changed its position in the pelvis.

The history of a stone in the left kidney with severe pain would indicate that on that side the patient had a small stone which has been expelled through the ureter in the meantime; 90 per cent. at least of all kidney stones can be expelled naturally through the ureter. That is undoubtedly what happened to the stone that was recognized by means of the *x*-ray some years ago in this case.

The stone in the right kidney at this time must be irregular in shape and held in one of the calices of the kidney and kept there distinctly by its form, so that it can never get into the ureter. Consequently, the ureter cannot be dilated to the extent of permitting it to pass.

If one operated for the removal of every stone that one is able to demonstrate, one would have to operate at least ten times in order to relieve the one that requires the operation. Nine out of every ten will recover spontaneously and, consequently, if one is in the habit of operating immediately on making a diagnosis, one would operate nine times unnecessarily for every once that you would operate where it was proper to operate. We have hundreds of these cases who have had renal colic—I have not looked up the exact number.

The plan that we follow is to give the patient 2 ounces of glycerin every night for two or three nights in 1 pint of sour lemonade and then give ½ pint of distilled water every hour. In a large majority of these cases the stone will slip out within a week or so. The amount of glycerin that is given is not sufficient to cause poisoning. Then, after the stones have passed out, we give the patient a diet and at least ½ gallon of distilled water every day for the rest of his life so that he will not re-form stones. Harrison Quibbs demonstrated the fact that the urine must be of a certain concentration in order that stones may be formed. Now by giving the patient ½ gallon of distilled water every day for the rest of his life the urine will not acquire the concentration that is necessary for the formation of stones. If a patient who has suffered from renal colics for years can be relieved permanently by simply following this simple method, why should we operate?

I have under my care at the present moment for another condition a patient who for the last twenty years has had renal colic every three or four months. This patient, who is a physician, had passed calculi for several years. It would take about three to six months to form a calculus, then it would loosen, he would have renal colic, and the calculus would pass. Twenty-eight years ago I kept him asleep an entire day off and on with chloroform in order to permit this calculus to pass. He has used dis-

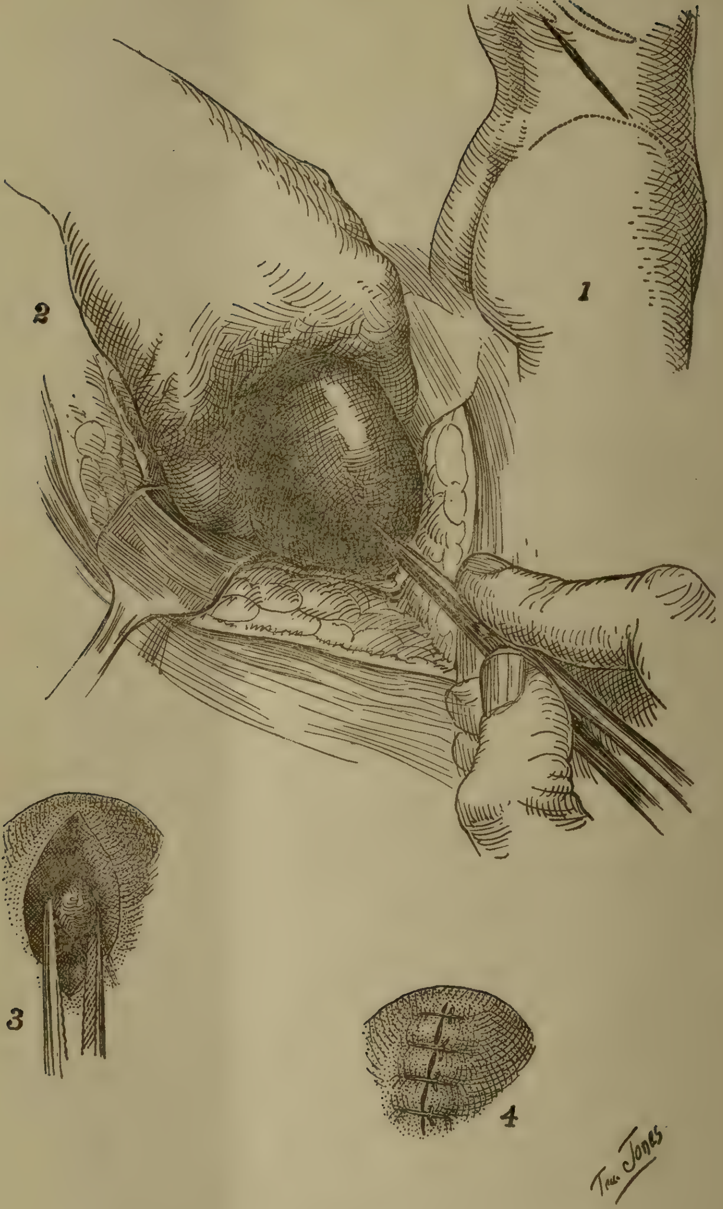

Fig. 154.

tilled water ever since and has had no recurrence. Before that for years he passed one, two, or three calculi a year. In many cases I have observed a shorter period of time. Another patient, who is a friend and not a patient at the present time, I have observed for twenty-six years. Some of them I have had under observation for twenty years. I have one of these cases under observation who came in with renal colic sixteen years ago. We put him upon the treatment I have just described. He passed his calculus and was free from further trouble for eight years, drinking distilled water all the time. Eight years ago he built a new house and was too busy to drink the distilled water. He drank the well-water that he drank before he had the first colic, and before the summer was over he was brought in again from Wisconsin with renal colic. I put him on the same treatment and he passed a calculus 2 cm. in length and about 7 mm. in diameter. He went back on his distilled water treatment. He has been free all these years from the presence of calculi. I had another patient who had exactly the same condition and who was free from calculi for a number of years by drinking distilled water. Then he went back to the old waters and had recurrence of the renal colic.

This patient is seventy-six years of age. We will expose her to just as short an anesthesia as possible by working rapidly. I make an oblique lumbar incision (Fig. 154, 1) and bring the kidney into view. We have said before that we have also made a diagnosis of gall-stones in this case, and that at her age the gall-stones are very likely to be filled with lime, and that, consequently, the *x*-ray gives the shadow of a large gall-stone instead of the shadow of a renal stone. I made a diagnosis of cholelithiasis. There is the kidney exposed here. Now, if there is a stone in here, it will be in the upper pole.

It is not possible to determine the presence of stone in this

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Fig. 154.—Case of gall-stones and kidney stone. 1. Line of incision which provided access both to the gall-bladder and kidney. 2. The kidney pulled out and the blunt end of a cambric needle caught in a forceps being pushed into its substance to determine the presence and location of a stone in one of the calices. 3. Removing the stone through a small incision parallel to the long axis of the kidney. 4. Closure of the renal wound with interrupted catgut stitches.

kidney positively by palpation, so I hold the kidney between two fingers and puncture the cortex with a straight needle held in a pair of forceps opposite the point at which we expect to find the stone (Fig. 154, 2). As the needle strikes the stone I get the characteristic sensation. There is a stone here, and it is out of the question to attempt to remove it without incising the kidney substance. I place these sutures through the substance of the kidney under the guidance of my finger in the pelvis, so as to grasp the entire thickness of the renal parenchyma, and so get perfect control of the local blood-supply, and then cut directly down on the stone. Its removal is not difficult (Fig. 154, 3, 4). With the exception of a little superficial oozing I have perfect control of the hemorrhage. Now I place this gauze directly over the wound in the kidney, by this means overcoming the slight superficial oozing.

It is quite convenient to remove the gall-bladder through this same opening. We place a pair of forceps upon the cystic duct just below the point at which the stone can be felt. We are not yet ready to close our incision in the abdominal wall. I have now opened the peritoneal cavity, and I can feel a stone which seems to be impacted in the cystic duct. A cystic duct which has been the site of a calculus infection, upon removal of the calculus is very apt to develop scar-tissue contraction or stricture, or become the site of a new stone. Therefore, as a rule, cholecystectomy is indicated in such cases, and we shall proceed with that operation at once. It is quite convenient to remove the gall-bladder through this same opening. We place a pair of forceps upon the cystic duct just below the point at which the stone can be felt. This forceps closes the cystic duct and at the same time compresses the cystic artery, so that there will be no hemorrhage from this source. A second pair of forceps is placed distal to the first pair and the cystic duct is cut between these two forceps. A pair of forceps on the side of the gall-bladder serves very nicely as a retractor, by means of which we are able to steady the gall-bladder while freeing it from its attachment to the liver. This gauze is then packed against the raw surface of the liver down to the point of the forceps which remains attached to the cystic duct, and either a glass, a rubber, or a cigarette drain is carried down to the point of the forceps which remains attached to the cystic duct. These forceps will be removed after forty-eight hours; the drainage is introduced in order to take care of any bile which may subsequently escape. The drainage-tube is left in place for about one week. The gauze packing against the surface of the liver is loosened by gentle traction on the fifth or sixth day after the operation and slowly removed.

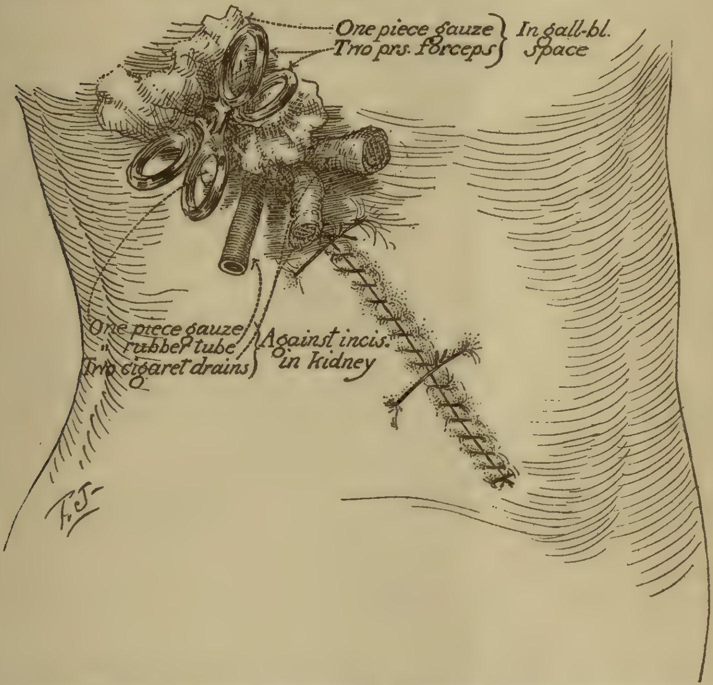

Fig. 155.—Closure of lumbar wound with drainage to both the renal and gall-bladder spaces. The forceps are clamped on the cystic artery and duct.

It is possible that a small amount of urine may escape from the cut surface of the kidney, but as the urine is sterile it will do no harm, and it is not likely that much will escape in this way. The wound is closed by successive layers of sutures grasping the cut ends of the muscle, the deep fascia, and the skin, the cystic duct drain, as you see, passing out through the incision in the loin (Fig. 155).

The patient will lie on her back, but tilted a little toward the right side, being carefully bolstered up by pillows and pads so as to prevent pressure on the forceps which we have left on the cystic artery and duct, and at the same time encourage drainage by gravity through the wound in the flank.

The gall-bladder which I have just removed has been split open by the pathologist and you can plainly see the changes in the mucous membrane, particularly in the region of the impacted cystic duct stone (Fig. 156).

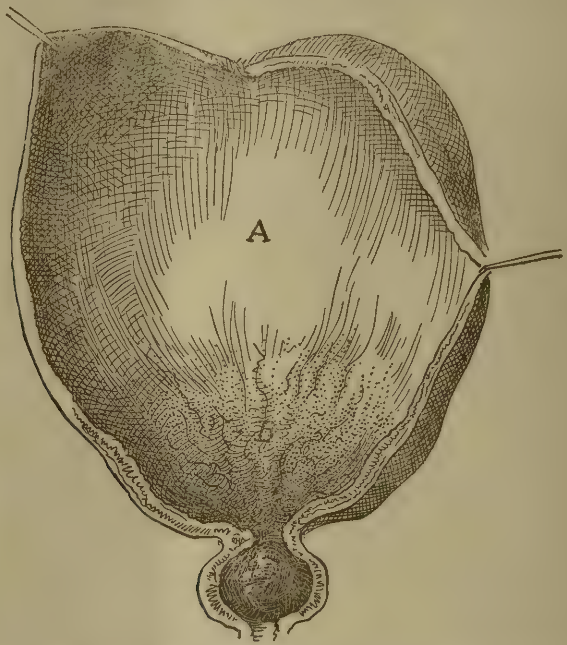

Fig. 156.—The gall-bladder removed. It was full of bile-pigment stones and one of them was impacted in the cystic duct as shown. The mucosa in the fundus (*A*) was comparatively smooth, but at *B* there was marked injection of blood-vessels and edema of the mucosa.

Note.—The gall-stone was 1.2 cm. in diameter, made up of concentric layers of bile-pigments. The renal stone was a typical "mulberry" stone. These two objects correspond in size to the two shadows on the radiograph of the right upper abdomen. A radiograph taken one week after operation showed no shadows.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

KIDNEY STONE

Summary: A patient presenting the typical signs and symptoms of renal calculus; technic of pyelotomy; methods of diagnosis—development of the technic of *x*-ray examination—relatively slight value of cryoscopy—cystoscopy, ureteral catheterization, and the phthalein test of prime importance; treatment—indications for operation—many cases best handled expectantly; nephrolithotomy—the indications—incision in Brödel's line—postoperative hemorrhage; the silent renal calculus.

January 4, 1918.

THE patient whom I shall show you today is a case in which we have made a clinical diagnosis of renal calculus and an *x*-ray diagnosis of a stone about $\frac{1}{2}$ inch in diameter, probably in the pelvis of the right kidney. The *x*-ray shows no evidence of stone in the left kidney. The symptoms have been rather typical and classical.

The patient, a man of thirty-eight, was brought to the hospital suffering from an acute attack of renal colic. He said that this was the fifth attack of the kind that he had had. They were all very similar in character, coming on rather suddenly, with acute, very severe pain beginning in the right lumbar region, radiating down toward the bladder and the external genitals. The pain was so severe that he had to assume the recumbent position and it required $\frac{3}{4}$ grain of morphin before the worst of the pain was relieved. The morphin was given in divided doses of $\frac{1}{4}$ grain each at intervals of about one-half hour.

The urine showed microscopically red blood-cells, and the patient stated that on several occasions there had been gross blood in the urine and that he had passed, in some of the attacks, small blood-clots. Between the attacks the patient was quite well.

The patient's general condition is good. There is no evidence of serious kidney lesion or heart lesions, and he is a first-class surgical risk. I shall operate on the case under general anesthesia and employ drop ether.

As you see, I have the patient rolled over on his left side and the assistants have placed a good-sized pad under the left pelvis so as to widen the space between the crest of the ilium and the last rib on the right side. I make an incision beginning at the costovertebral angle, passing downward and outward obliquely to a point about a fingerbreadth above the crest of the ilium (Fig. 157). This divides the skin and superficial fascia, and, as you see, I come now to the muscle, the latissmus dorsi, which must be divided. I divide now the layer of lumbar fascia and expose the quadratus lumborum. Continuing the dissection, I find a large nerve running parallel with the incision, accompanied by an artery and vein of good size. This is the twelfth intercostal nerve with its accompanying vessels. I now divide the

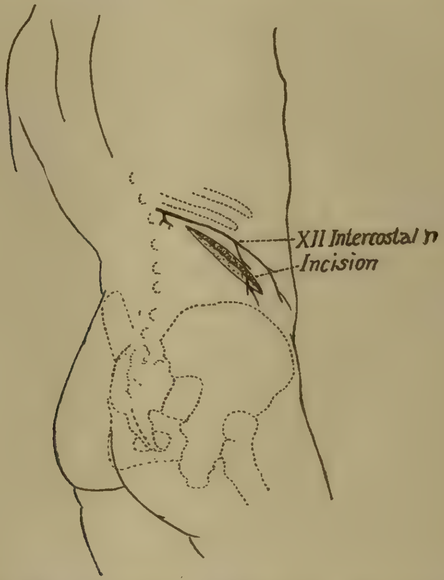

Fig. 157.—Oblique lumbar incision for exposure of kidney and its relation to the crest of the ilium, the twelfth rib, and the twelfth intercostal nerve.

second layer of the lumbar fascia and expose to view the fatty capsule of the kidney (Fig. 158). I extend my incision forward and divide the external oblique muscle for a short distance. Introducing both hands, I now stretch gently the edges of the wound, enlarging it so as to give me free access to the kidney. I am now dividing with blunt dissection the fatty capsule of the kidney, coming down to the fibrous capsule of the kidney. There has been a slight perinephritic process, making it a little more difficult than normally to separate the fatty from the fibrous capsule. I am accomplishing this, however, without much difficulty. I free first the posterior surface of the kidney, then the anterior, then the inferior pole, and then the upper pole, and free the kidney entirely except at its pedicle, that is, the attach-

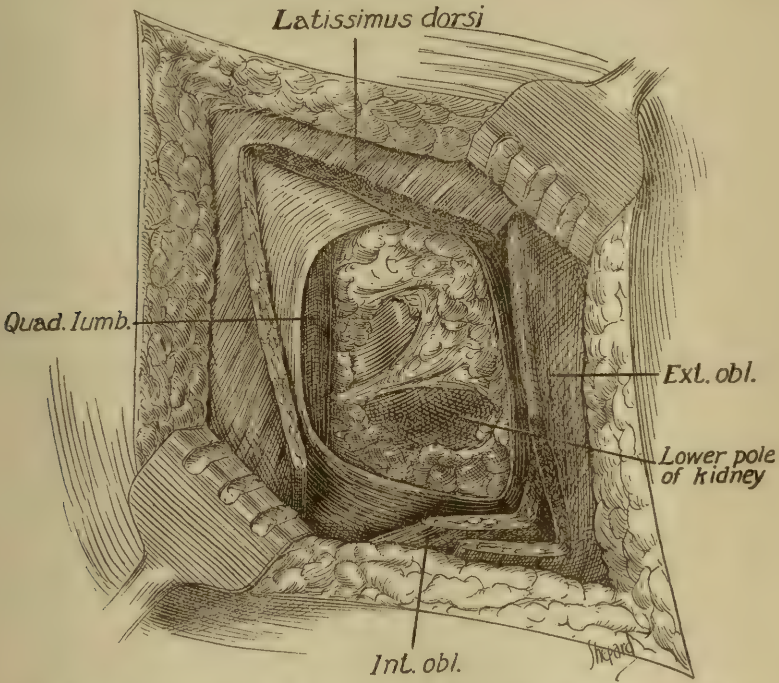

Fig. 158.—Details of the oblique lumbar incision; note the muscular and fascial planes opened as the dissection is carried down to the fatty capsule of the kidney.

ments of the great vessels and the junction of the ureter and pelvis. In doing this I can now feel quite distinctly a stone, which is, fortunately, in the pelvis of the kidney. After freeing the kidney, I gradually, as you see, without any force bring the kidney gently up into and out of the incision. We shall be able to do here the operation of pyelotomy, that is, remove the stone through the incision in the pelvis. It will then not be necessary to do a nephrolithotomy, that is, a division of the secreting substance itself.

Holding the kidney out of the wound, I now take a pair of dissecting forceps without any teeth and free the posterior surface of the pelvis from the fat and areolar tissue covering it, so that I can expose for a distance of $\frac{3}{4}$ inch the posterior surface of the pelvis itself. I think this is quite an important step in the operation because it enables me to see whether there are any large vessels crossing the posterior surface of the pelvis. Normally, of course, the pelvis lies behind the renal artery and renal vein, but occasionally a branch of one of these vessels crosses the posterior surface in a position where it may be injured if it is not recognized in making the incision of pyelotomy.

I now make an incision about $\frac{1}{2}$ inch long through the posterior surface of the pelvis, in the long axis of the pelvis, coming down directly on to the stone. I introduce this small pair of blunt forceps, which has been a favorite instrument of mine for years in doing these pyelotomies, and one which I also employ frequently in removing stones from the common duct. I grasp the stone and, as you see, I have no difficulty in removing it (Fig. 159). The stone has an uneven surface like that of a mulberry, and is probably an oxalate stone. I shall make no effort to close the incision in the pelvis by suture. There was a time when I paid special attention to this, but I think, on the whole, it is better not to make any effort at suturing the incision in the pelvis. The structure is very thin walled, and any suture that might be introduced carries with it the possibility of forming a nucleus of another stone. We have found that these incisions heal up so rapidly without suture that for a long time we have discontinued the practice of the introduction of a suture. One may, I think, properly suture the fat and areolar tissues overlying the posterior surface of the pelvis with fine catgut suture. This I shall do. The kidney is now dropped back into its normal position. I carry down to the point of incision in the pelvis two small cigarette drains and bring these out through the upper part of the external incision. I now close the wound with deep buried catgut through the muscles, and with four silkworm-gut sutures through all of the structures, and with black linen for the integument. A copious gauze dressing is applied. There has been, as you see, very little hemorrhage in the operation—practically none from the incision of the pelvis itself.

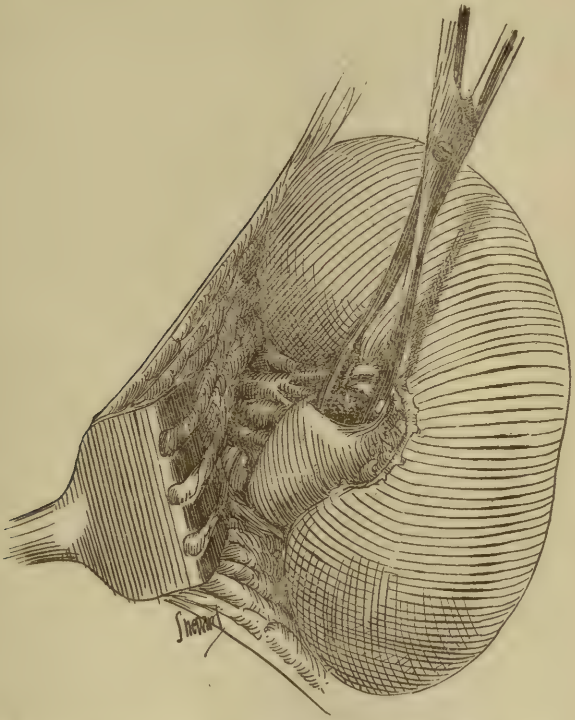

Fig. 159.—Pyelotomy: the posterior surface of the pelvis of the kidney has been carefully stripped, incised, and a mulberry calculus is being removed by means of a small pair of blunt forceps.

The prognosis, of course, in this case is excellent. The after-history in most of these cases has been that we have removed one cigarette drain at the end of forty-eight hours and the second at the end of four or five days, and that little or no urine escapes from the pyelotomy wound. There is for twenty-four hours a fair amount of primary wound secretion, and occasionally urine escapes for a week or ten days after the operation, but this is the exception. These patients are allowed to sit up on the fourth or fifth day. The silkworm-gut stitches are removed on the eighth or ninth day and patients allowed to leave the hospital by the twelfth day.

I want to take this very simple kidney stone as an opportunity of discussing with you pretty fully the subject of renal calculus. My medical work has covered the entire period of development of modern kidney-stone work and I have taken a special interest in the subject. The first kidney-stone operation was done by Henry Morris, a British surgeon, in 1880. This was done long before the days of the *x*-ray and the diagnosis was based upon the clinical findings. Morris, in the next few years, operated on a number of cases successfully and was able to report some 30 odd cases with but 3 per cent. mortality. In this early period the diagnosis was exceedingly difficult, the trained surgeon not knowing whether there were stones in one or both kidneys, not knowing the size of the stones, or the number of stones in any particular case. Nor did we have the means at that time to determine even approximately the functional condition of the two kidneys separately. Yet, in spite of all these handicaps, a good deal of excellent surgery was done from the time of Henry Morris' first case in 1880 until the introduction of the *x*-ray and its employment in detecting renal calculi, which occurred in about 1897. In 1898 I was one of the first surgeons to employ the *x*-ray as a means of diagnosis in kidney stone. Leonard, of Philadelphia, several years later in an article in the Annals of Surgery, discussed quite fully the historic side of this subject, and I am glad to say that he found that we in this clinic employed the *x*-ray in detecting kidney stones before it had been employed in Central Europe. At first, of course, our *x*-ray apparatus was crude as compared with our modern machines, and the employment of the *x*-ray carried with it the danger of burning the patient. One of my early cases was a patient of about sixty-five, who had a single stone in the pelvis of the kidney, very much the same sort of a picture as in the case we have just operated on. He was *x*-rayed three different times at intervals of a few days, and was exposed for from ten to twelve minutes in each one of these exposures, and even then the plate which we obtained was not very satisfactory, although the stone could be seen covered by the twelfth rib. A few days after the last exposure I operated on the patient and removed the stone. A week later he developed what I then regarded as an atypical erysipelas on the anterior surface of the abdomen. The reddening, which deepened and was not associated with much temperature or pain, I studied with a good deal of care and demonstrated in my clinic as an atypical erysipelas, stating at the time that I had never seen a similar case. This proved later, however, to be a typical and rather severe *x*-ray burn, and this was the first *x*-ray burn I had ever seen. Fortunately, it was not of permanent injury to him, although it was six or seven weeks before it had completely healed.

With the crude apparatus at first employed a good many stones were missed and not diagnosed in our *x*-ray examination. Gradually, however, with the improvements that have been introduced, stones the size of a pea and larger are readily recognized and detected, and in the hands of experts the *x*-ray has become our most certain means of diagnosis in renal calculus.

The general introduction into our clinical work of cystoscopic examination and catheterization of the ureters, and examination of the two urines separately, and the introduction of the phthalein test has added enormously to our means of making a definite diagnosis in these cases, and determining frequently whether we can safely do a nephrectomy in kidney-stone cases where, because of the number of stones, associated infection, and destruction of the kidney tissue, it becomes necessary in order to secure a permanent cure to remove the kidney at the time of the primary operation.

For a time we did a large amount of work determining the freezing-point of the blood with the idea that this might be of great value in determining the kidney sufficiency and deciding for or against nephrectomy. This, however, has been gradually given up and has been superseded by the more valuable phthalein test and examination of the right and left urines separately.

The development of kidney-stone surgery has been such that it now rests upon thoroughly sound and scientific principles. We can point to this subject as an example of triumph for scientific clinical research. A patient coming to us today suffering from the clinical picture suggestive of kidney stones is analyzed scientifically just as the assayer analyzes a bit of mineral submitted to him, and in the following way:

First, a careful and complete history of the case is taken, and let us imagine that it is suggestive of renal calculus. The patient is then *x*-rayed and the presence or absence of kidney calculus determined. We also determine at this time if there are stones present in one or both kidneys, the size of the stones, the number of the stones, shape of the stones, probable location of the stones—whether in the pelvis or in the calices—examination of the right and left urine, determination of the presence of pus, blood, and micro-organisms. The phthalein test gives us a fairly reliable knowledge of the function of the right and left kidney. With this evidence and from evidence obtained of the general physical condition of the patient, you can determine the presence of the stone, its location, and decide for or against operative interference. You can often determine before operation whether a pyelotomy will be required, or a nephrolithotomy, or a nephrectomy.

About 20 per cent. of all kidney-stone cases will be shown, on careful examination, to be bilateral. These bilateral cases form one of the most difficult problems we encounter in surgery.

What shall we do with a patient in whom we are able to make a definite diagnosis of kidney stone in the way of therapy? Shall we immediately operate on these cases and remove the stone? Shall we accept this as the routine treatment? Certainly not! Each one of these cases must be analyzed separately as an individual problem. Where we find a single stone in the pelvis of one kidney and the patient is a good surgical risk, if that stone is ½ inch or more in diameter, the clear indication is a surgical operation and removal of the stone through a pyelotomy. The early operations for stones of this size were nephrolithotomies, and surgeons for a long time hesitated to do pyelotomies because of their fear that a permanent fistula might result. It was thought that wounds through kidney tissue heal much more rapidly than incisions in the pelvis. We soon learned, however, that this was not true, that incisions in the pelvis heal up quite as readily as incisions through the kidney tissue, and are no more apt to be followed by permanent urinary fistulæ. On the other hand, we very soon learned that incision of the kidney tissue made in a nephrolithotomy carried with it a great deal of risk from hemorrhage. I have had to do secondary nephrectomies in about 8 or 10 cases within a week or two weeks after I had done a nephrolithotomy, in order to save the life of the patient from secondary hemorrhage. All surgeons who have done a large amount of this work had the same experience. It is, therefore, on account of the danger of secondary hemorrhage that we now insist upon a pyelotomy rather than a nephrolithotomy. It is not, however, possible always to do a pyelotomy. In large stones, in multiple stones, in coral-shaped stones that fill the pelvis and calices, it is impossible to remove stones through an incision through the pelvis alone. On that account in a certain number of cases we still have to resort to an incision in the kidney tissue itself. Where this is made, it should be about ⅓ inch posterior to and parallel with the convex border of the kidney, as anatomic investigations show that this particular region contains fewer large blood-vessels than does the kidney tissue either in front or behind it (Fig. 160). The nephrolithotomy incision should be closed with large, soft catgut introduced through the kidney tissue with a round, non-cutting needle. We have never experienced any difficulty in controlling primary hemorrhage in these cases when closing the kidney incision properly with catgut, just as we control hemorrhage from the lip in removing a V-shaped piece in the operation for epithelioma of the lip, not by ligating the vessels, but by direct suture with silkworm-gut. The hemorrhage that occurs is, as a rule, late, coming on from a week to ten days after the operation. When it does occur it furnishes one of the most distressing pictures that a surgeon can encounter. In our own experience the cases have been very much alike. The hemorrhage is usually not through the external incision, but through the ureter, filling up the bladder with blood-clots, accompanied frequently with attacks of renal colic because of the obstruction of the ureter with a blood-clot. A patient with 80 per cent. or more hemoglobin before operation is found after one of these hemorrhages to have only 60 per cent. The hemorrhage ceases and the surgeon then washes the blood-clot out of the bladder and hopes there will be no repetition. Unfortunately, however, repetition usually does take place two or three days later, and we have followed these cases until after the second or third or fourth hemorrhage the hemoglobin would go down to 35 or less, and then, in order to save the life of the patient, we have done a rapid nephrectomy under gas-oxygen anesthesia, which, of course, controls the hemorrhage and has in our cases enabled us to save the lives of the patients. These nephrectomies can, of course, be rapidly made, not requiring, as a rule, more than five minutes, as the incision is readily opened after removing the sutures, the kidney removed, and closure made not with layer suture, but simply with through-and-through silkworm-gut sutures.

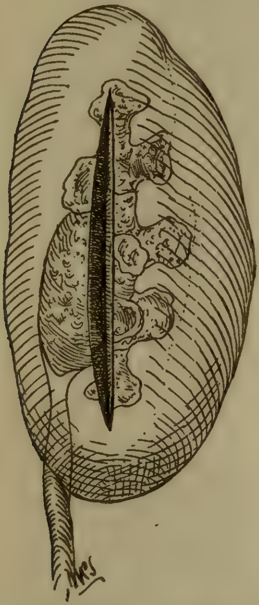

Fig. 160.—Incision for nephrolithotomy; it is so placed as to avoid most of the large vessels in the kidney substance (Brödel's line).

Where a patient has a renal calculus that has passed down into the ureter, the case then presents a different problem. As a rule in our clinic we have taken the position that there is a fair prospect of the passage of the ureteral stone if it is not larger than the size of a coffee-berry, and unless there is some mechanical condition or some emergency demanding operative interference we have felt that it was wisest to watch these cases for weeks or even months in the hope that the stone would pass through the normal channels, and I think this is the sane position to take. I have frequently had cases referred to me to be operated upon where the clinical picture was that of renal colic, and the *x*-ray showed a stone in the ureter of small size, where I have taken the stand that it would be wisest to wait and hope that the stone would be passed; and in the majority of cases of this kind the stones are passed and a cutting operation avoided.

There is another class of kidney-stone cases today in which good judgment, I think, dictates an extended management in preference to operative interference. These are the cases in which kidney stones are found accidentally in making careful *x*-ray examinations of patients suffering from other conditions, where there is no clinical picture of distress produced from the presence of calculi, especially in cases where there is some organic lesion making the individual a poor surgical risk, and where there is no complication demanding immediate interference; careful analysis of all of the evidence in cases of this type leads the surgeon to conclude that it is safer not to interfere. We have watched quite a large group of these cases, and I am satisfied that here, as in gall-stone disease, the trouble given by the presence of the kidney stone varies tremendously. I have seen a number of cases where the kidney stones had existed for years and where they were simply innocuous, where they gave rise to no symptoms whatever, and I have seen cases which, after giving rise to symptoms of typical calculus attacks, have remained latent for months and years without any recurrence of the attacks. The point I want to make is that we cannot properly insist upon operation for the removal of kidney stones merely because we have definite evidence of its presence. We must analyze each individual case, weigh all the evidence, and determine whether in that particular case operative interference or extended treatment is the wisest and safest course to pursue.

URETERAL STONE

Summary: The diagnosis of ureteral calculus—difficulties in the differentiation from appendicitis—necessity of checking up the *x*-ray evidence—calculus anuria—reflex ileus; technic of extraperitoneal removal of ureteral calculi—the intracystic and perineal routes; history of a patient with a calculus in a horseshoe kidney.

January 11, 1918.

At the last clinic I had the opportunity of presenting to you a patient with stone in the kidney. This morning I shall present to you a case in which we have made a diagnosis of stone in the ureter.

This patient is a man thirty-eight years old, who has had repeated attacks of renal colic in the right side, which began about eighteen months ago. He has had four sharp attacks requiring morphin and several minor attacks. When he came to us a few days ago we found a few red blood-corpuscles and a little pus in the urine. The character of the attacks have been such that one or two of the physicians who have seen him have thought of the probable diagnosis of appendicitis, because he has had a definite localized tenderness after the attacks in the region of the appendix, and during several attacks there has been a good deal of vomiting and considerable tympany and distention of the abdomen from a reflex paralytic ileus. *x*-Ray picture of the kidneys shows no stones, but *x*-ray of the right ureter shows a stone about ⅔ inch in length and apparently about ⅓ inch in thickness. Pressure over the ureter at the site of the stone, which is at a point a little above McBurney's point, elicits tenderness. The stone is of such size that I do not think there is any fair prospect of its passing through the ureter. On that account we shall remove it by surgical operation.

The patient has been anesthetized with drop ether, and, as you see, I have him flat on his back in the same position that we would employ in an ordinary interval appendicitis operation. I shall make here a muscle-splitting operation just as we do in the operation for removal of the appendix; a little larger incision than we ordinarily employ and ½ inch or so external to the ordinary appendix incision (Fig. 161, 1). I divide through the skin and superficial fascia, and split the external oblique parallel with its fibers, and the internal oblique and transversalis in the same way, splitting the aponeuroses of these two muscles over the rectus muscle almost to the midline. I am now stripping up the peritoneum from the iliac fossa. I do this without any difficulty, and now come down to the stone in the ureter. The ureter is pretty firmly attached to the peritoneum at this point. With a

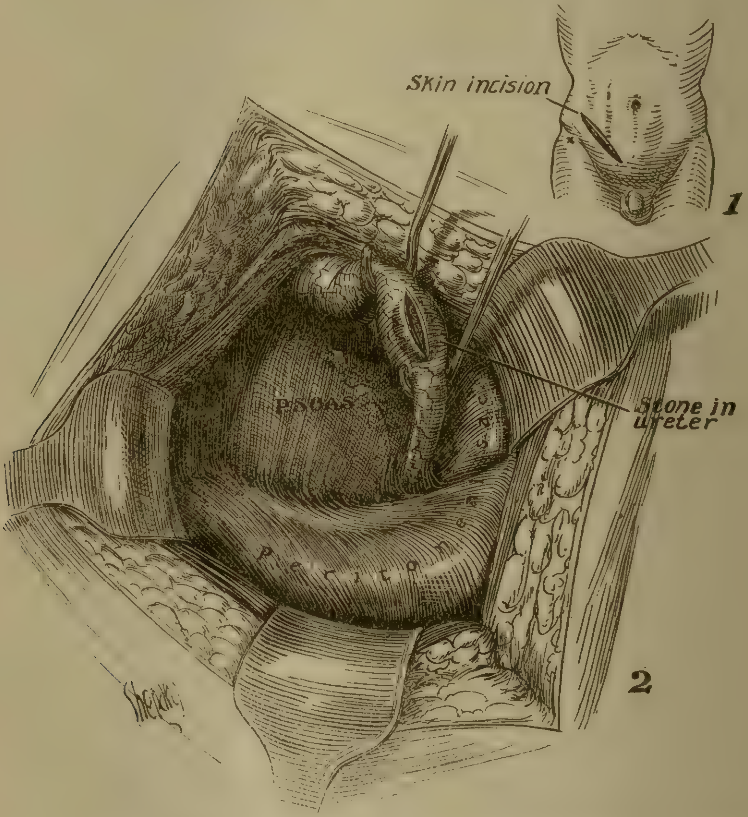

Fig. 161.—Incision (1) and dissection (2) for extraperitoneal removal of ureteral calculus.

careful dissection, however, with a blunt dissecting forceps I separate the peritoneum from the ureter for a distance of about 3 inches. I now take two blunt hooks and place them under the ureter, one about 1 inch above the stone and one about 1 inch below, and have the assistant hold the ureter well into the wound (Fig. 161, 2). With a sharp knife I divide the ureter for a distance of about $\frac{1}{2}$ inch over the stone and without any difficulty lift the stone out and remove it. I shall not attempt to suture this ureter, but simply carry down to the incision a small cigarette drain. I now close the wound just as we would the muscle-splitting incision for appendicitis. You will see there has been very little hemorrhage. The prognosis in this case is excellent. The man's general condition is good, and I have no doubt that he will go on to a good recovery unless some unusual complication develops.

Stones in the ureter have not been as common in our work as stones in the pelvis of the kidney and calices of the kidney. They have been a rather difficult problem in the past from the standpoint of diagnosis, and surgeons have made a great many mistakes and operated a great many cases where ureteral stones were non-existent. The evidence in this case, however, was very definite and very conclusive, and the size of the stone and its position left little doubt as to the diagnosis. Most of the mistakes that have been made in connection with supposed stones in the ureter have been due to *x*-ray findings that showed shadows that were supposed to be stones, but which at the time of operation were not found. These shadows have been, for the most part, due to two different conditions: one, centers of ossification in the pelvic ligaments, especially opposite the spine of the ischium and in a position where they were suggestive of stone in the ureter, and second, calcification of old tuberculous processes in lymphatic glands in the pelvis and abdomen. I have noted a third unusual condition in a few cases, and that is, material in the alimentary canal of some kind which is capable of throwing a shadow.

In regard to the means which we have of determining before operation definitely whether these shadows are in the ureter or not, we have at our disposal a method which will almost invariably prevent these mistakes, and that is the introduction of a ureteral catheter and taking an x-ray picture with the ureteral catheter in place, using a catheter that will throw a dense shadow. Not infrequently, of course, the ureteral catheter will simply pass to the stone which obstructs the ureter at that point. In other cases, however, the ureteral catheter will slide by the stone, but in these the x-ray picture will show the stone lying in close contact with the catheter. In any case in which the evidence is not absolute that the supposed shadow is a stone in the ureter, this method should be resorted to. A short time ago I was called in consultation to see a patient by his attending physician who had had no history of kidney-stone colic, but who had had an examination for life insurance, and the urine in this examination showed a little pus and a little albumin. An x-ray picture was taken and a very definite shadow was found, and this was confirmed by two or three plates. This shadow was in the left ureter about 3 inches below the pelvis of the kidney, and the attending physician had called in a surgeon who advised immediate operation. I saw the patient about three days after he had been examined by the first surgeon and asked for a confirmation of the x-ray plate. The roentgenologist suggested giving the patient a cathartic to clean out the bowels and then taking the picture. This was done, and when the pictures were taken the next day they showed an excellent differentiation—the shadow had disappeared entirely. In this case it was fair to suppose that the body which caused the shadow was in the alimentary canal and was passed in the feces.

I have had a rather interesting experience in 4 or 5 cases making a differentiation between appendicitis and ureteral stone, and I have in at least 3 cases operated and removed the appendix in the interval, and then found later by a more thorough examination the presence of a ureteral stone on the right side. Ureteral stones that are impacted high up in the ureter close to the pelvis should be removed by the posterior kidney incision. Those that are in the central part of the ureter, such as the case we have just operated on, should be removed by this muscle-splitting incision. Occasionally stones impacted in the lower end of the ureter close to the bladder can be removed by intracystic manipulations, the introduction of a cystoscope, and stretching or incising the internal orifice of the ureter, permitting the removal of the stone from within the bladder. Stones that are no bigger than a coffee-berry usually pass, and they may be assisted by throwing some oil into the ureter through the ureteral catheter.

I have had a few unusual experiences in operating on large stones embedded in the lower end of the ureter. One of these was of peculiar interest and was attacked by an unusual route. The patient had suffered for years from repeated serious acute attacks associated with renal colic and followed by the passage of large amounts of pus into the bladder. x-Ray examination showed a stone about $1\frac{1}{2}$ inches in length and about 1 inch in diameter embedded in the lower end of the ureter. The man was rather thin, and I decided to remove the stone through the perineal route. Placing him in the lithotomy position, I made the old left lateral lithotomy incision, and without dividing the prostate separated the tissues by blunt dissection until I could feel this large stone just above the prostate. I incised the dense connective-tissue capsule in which it was embedded with a pair of scissors and removed the stone without crushing it. I drained the incision for a few days and he went on to an uneventful recovery.

Stones in both ureters are sometimes met with and associated with the picture of anuria. I have had several experiences with cases of this kind. Occasionally, if the patient has had one kidney removed for ureteral stone, the other ureter becomes obstructed by stone and gives the picture of complete mechanical anuria, or we have had this experience also, of one kidney being destroyed and reduced to a hypernephrotic sac or pyonephrosis as a result of calculus disease, and then the ureter of the sound kidney become obstructed with calculus, giving again a picture of complete mechanical anuria. Another type of case, however, is met with, and that is obstruction of the ureter of one kidney, the remaining kidney being perfectly sound, and yet a complete anuria develops.

This has been called reflex anuria. It has been demonstrated in the laboratory that such a condition can be produced by obstructing one ureter and increasing very greatly the intrarenal tension on that side, and have it associated with a reflex effect upon the sound kidney sufficient to prevent its secreting urine. It is surprising how long patients can live in apparently good condition with complete anuria. The first patient of this kind that I saw some twenty years ago was a young man of about twenty-five, who was brought to my hospital with the statement that he had not passed any urine for eight days and that the introduction of a catheter into the bladder showed that it was perfectly empty. I was not familiar at that time with the condition of anuria, and I ridiculed the idea that such a thing was possible, and said that there must be some mistake and that it would be impossible for a patient to live for eight days without passing any urine. On investigating the subject, however, I found that patients had lived as long as twenty days with complete mechanical obstruction of both ureters. Mechanical anuria, of course, demands operative interference, and this cannot be postponed, as a rule, more than two or three days. If the *x*-ray shows definitely the fact that both ureters are blocked with stone and the condition of the patient warrants it, operation should be done for the purpose of removing the stones. If, on the other hand, the patient is not in good condition, if the cause of the obstruction cannot be definitely located, and if it cannot be easily and safely removed, the patient should have a pyelotomy and drainage of the pelvis of the kidney done, and best, I think, under gas anesthesia. I prefer gas here to ether because of the bad risk that ether would carry to the damaged urinary tract. The operation is, as a rule, not difficult, and there should be introduced into the pelvis a small No. 10 or No. 12 soft-rubber catheter, which should be sewed in position. This will provide an escape for the urine, and then conditions can be carefully gone into with the idea of removing the cause of the obstruction later in a second sitting when the patient is a better surgical risk.

There is one clinical picture in connection with stones in the kidney and ureter which is sometimes most confusing, and that is the simulation of the picture of ileus which sometimes is so suggestive of acute obstruction of the bowel that the surgeon is led to operate with this diagnosis. I have had a number of these in my own service, the symptom-complex being that of sudden acute pain, with vomiting, gradual distention of the bowel, and the impossibility of obtaining any bowel movement, and the existence of very little evidence calling attention to the kidney lesion. Not infrequently in these cases, if the ureter is obstructed by stone, there may be no microscopic or gross blood in the urine and no urinary findings suggestive of the presence of stone. A thorough *x*-ray examination very often gives us definite information regarding the diagnosis. In the symptom-complex which I have seen in several cases is one in which because of the persistent and often excessive vomiting the medical attendant has overlooked the real condition, and thought of the possibility of a stomach lesion and sometimes a gall-bladder lesion. I have seen several cases in which severe kidney-stone colics have been associated with acute dilatation of the stomach, the relationship being that of a reflex gastric ileus due to the kidney colic attack.

In discussing kidney and ureteral stone one must, from the standpoint of the differential diagnosis, take into consideration the other pathologic conditions that give very much the same general clinical picture, and these are tuberculosis of the kidney, neoplasms of the kidney, acute infections, such as colon infections of the kidney, and congenital cystic disease of the kidney. All of these conditions may present in common pus and blood in the urine and the picture of renal colic. Usually the differentiation must be made between three conditions, kidney and ureteral stone, tuberculosis of the kidney, and neoplasms of the kidney. As a rule the determining evidence of kidney stone is made by the *x*-ray, and the determining evidence of tuberculosis by the appearance of tubercle bacilli in the urine and cystoscopic examination of the bladder, with the frequent finding of the changes in the bladder mucosa around the ureter of the affected kidney. Where after careful examination in a case which presents blood in the urine and the picture of kidney colic you can demonstrate neither the presence of stone in the *x*-ray nor the presence of tubercle bacilli, one must look to the diagnosis of neoplasm as the most probable cause. Frequently, of course, in these cases the presence of a palpable mass in the kidney region assists materially in the diagnosis.

Blood and pus in the urine associated with kidney colic due to colon infections are by no means uncommon. Here a careful bacteriologic examination demonstrating the presence of the colon bacillus and exclusion by other means of stone, tuberculosis, etc., enables the surgeon, as a rule, to arrive at the correct diagnosis.

Blood in the urine with kidney colic due to congenital cystic kidney is a condition we have met with several times, and in some of these cases the well-known fact that a congenital cystic kidney is usually bilateral has enabled us to make the correct diagnosis after we have been able to demonstrate the presence of enlarged kidneys on both sides. In one of our cases, however, of an enlarged and cystic kidney the condition was limited to one side, and the diagnosis was not made until the exploratory operation. Fortunately, here a nephrectomy saved the patient's life, as he was rapidly going down hill from the continued hemorrhages, and had at the time of operation only about 35 per cent. hemoglobin.

Some of our kidney and ureteral stones have presented unusual pictures. One of these I shall briefly present to you for the purpose of giving you a more complete picture of this entire subject.

A man of forty-five was brought to the clinic with a diagnosis of an obscure abdominal tumor. This was about as large as two fists, and could be palpated in the region between the umbilicus and the symphysis in the midline. The symptoms had been those of acute, severe abdominal attacks associated with chills, fever, and great pain and tenderness over this mass. He had been operated on about six months previously by a surgeon in a neighboring city, who made an exploratory operation, and cut down to a mass which he felt he could not remove, thought the mass was probably malignant, made the operation purely exploratory, and closed the abdomen. When he came to us we found on making an *x*-ray examination a shadow of what was consistent with being a good-sized calculus a little to the left of the median line and apparently in this abdominal mass. Examination of the urine showed blood and pus. On cystoscoping the bladder, this was found normal. On passing ureteral catheters it was found that these could be passed up but a few inches, and then were obstructed. An *x*-ray picture with the catheters in place showed that the catheter on the left side led directly up to a shadow of a stone, and that on the right side stopped in the center of the abdominal tumor. A diagnosis of horseshoe-shaped kidney just above the lumbosacral junction with stone in the left portion of the mass was made. An operation was done, the patient placed in the Trendelenburg position, and the mass exposed. The horseshoe-shaped kidney was found and the stone could be distinctly felt in the pelvis of the left kidney. This was removed by direct incision into the pelvis, a pyelotomy, and the wound drained. The patient went on to a good operative and permanent recovery.

CHOLEMIA FROM OBSTRUCTION DUE TO COMMON DUCT STONE

Summary: A patient with jaundice, moderate abdominal pain, hemorrhage from the gums, and progressive loss of weight and strength; probable diagnosis; exploratory operation—the final diagnosis; postoperative course.

The case which we shall operate on this morning is a peculiar problem, a woman of about thirty, who until six months ago was in fairly good health. She complains of some pain in the right upper quadrant of the abdomen, not a severe colicky attack, but a mere sensation of distress which requires no morphin. This was followed by the gradual development of jaundice, with loss of weight and strength, and the typical picture of cholemia, with hemorrhages from the gums and the hemoglobin going down to 50, and such loss of strength that she could not get out of bed.

The case has been very carefully studied by my colleague, Dr. Sippy, for several weeks. A careful examination of the stomach and duodenum shows no evidence of a lesion. There has been no blood in the stomach contents and no evidence of pyloric obstruction; no blood in the feces and no evidence of a lesion of either the small or large intestine. The urine is normal outside of its high bile content. The jaundice has been present for a good many weeks, but has varied in intensity. She had no temperature until recently, and the last few days she has had a temperature varying from 99.5° to 100.5° F.

Physical examination shows some enlargement of the liver and a sense of resistance in the gall-bladder region, which may be simply an enlarged liver or distended gall-bladder.

The case is one of a large group of cases which we have had the opportunity of studying with a good deal of care, and in which, from the most exhaustive clinical examination, it is impossible to decide whether the common duct obstruction, which, of course, is perfectly evident, is due to gall-stones or carcinoma of the pancreas or a chronic interstitial pancreatitis, or possibly even a sclerotic process of the liver. On studying the case jointly with my colleague in internal medicine we have come to the conclusion that an exploratory operation is necessary to establish a definite anatomic and pathologic diagnosis, admitting any one of the possibilities which I have just mentioned.

The patient's condition was so poor that two days ago we made a direct blood transfusion, giving her somewhere from 500 to 600 c.c. This improved somewhat the general appearance of the patient. I have decided to give her a general anesthetic rather than to do the operation under local anesthesia. There can be no doubt but the operation carries with it a great deal of danger of hemorrhage. We recently lost a similar case from continual oozing from the mucosa of the gall-bladder. The postmortem in that case showed that the obstruction was due to a mass in the pancreas which was inflammatory and not carcinomatous. Weighing all the evidence, I have decided to give this patient the benefit of an exploratory, with the hope that we may find conditions that can be relieved permanently or temporarily. If we find gall-stones in the common duct and her condition warrants, we shall remove them and drain the hepatic duct. If we find a mass in the pancreas as the cause of the obstruction, we will probably simply drain the gall-bladder.

I am making the usual S-shaped incision which we employ in this clinic. The hemorrhage from dividing the tissues of the abdominal wall is moderate. Opening the peritoneal cavity I find a small, contracted gall-bladder full of gall-stones. I am operating, as you see, on the right side of the patient. I shall now go to the left side of the patient and make a careful examination of the cystic and common ducts. Introducing my left index-finger into the foramen of Winslow, I palpate the right free edge of the gastrohepatic omentum which contains the common duct. I find no stones in the cystic duct, but as I very gently examine the lower part of the common duct between my index-finger and thumb I feel a stone that is impacted in the ampulla of Vater. It is not a floating stone. I cannot displace it and it is evidently going to be somewhat difficult to remove (Fig. 162, *a*).

Inasmuch as the important factor is to secure drainage of the

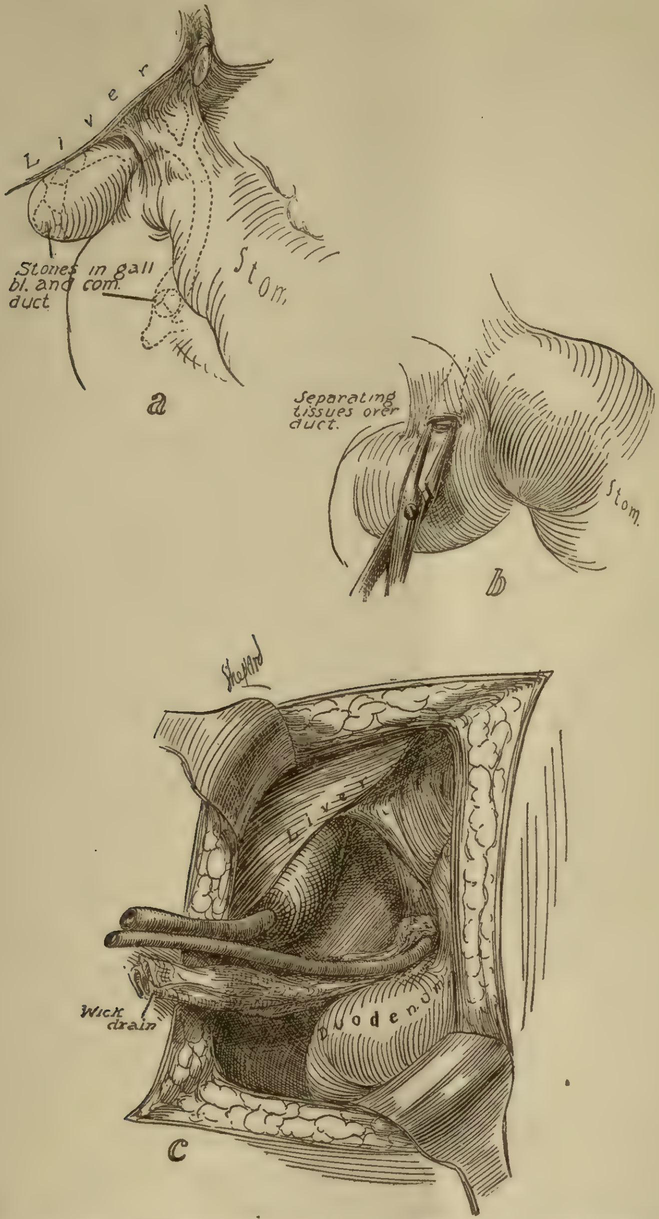
Liver
Stones in gall bl. and com. duct
Stom.
a
Separating tissues over duct.
Stom.
b
Liver
Wick drain
Duodenum
c

Fig. 162.—*a*. Diagnosis of conditions found at operation. Note stones in gall-bladder and in common duct. *b*. Approach to common duct above and laterally to duodenum. *c*. Abdomen about to be closed. Drainage-tubes in gall-bladder and common duct, the tube to the latter reinforced by a wick of gauze.

common duct and remove these stones, I shall do this stage of the operation first and do the gall-bladder later. I mean, of course, at this sitting, providing the condition of the patient warrants. With my left index-finger in the foramen of Winslow I lift up the lower part of the common duct, and in the angle between the duodenum and stomach I find that I can bring the stones up into view, and shall probably be able to incise the duct here and not have to do a transduodenal choledochotomy.

With a pair of fine closed artery forceps I spread apart the peritoneum and areolar tissue and separate these tissues from the anterior surface of the lower part of the common duct so that I can bring the common duct directly into view (Fig. 162, *b*). I can see the stones shining through its thin wall. Separating these tissues I have divided a small artery, which I want to clamp. Now I have the common duct uncovered. I make a small incision, $\frac{1}{2}$ inch long, directly over the stone. Rather to my surprise I find that there is not the single stone I expect, but that this mass is composed of three small faceted stones packed closely together. I remove these and introduce into the common duct a No. 12 catheter, and the bile flows out freely into the peritoneal cavity. This I mop up. I now take a very fine needle and fine catgut suture and suture this catheter into the common duct with one stitch. This one stitch controls the further flow of bile into the peritoneal cavity.

Dr. Herb, our anesthetist, tells me that the patient is in fairly good condition, so that I shall remove the stones in the gall-bladder and drain the gall-bladder, as I can do this very rapidly. If she were in excellent condition I would probably remove the gall-bladder at this sitting, but that would carry additional risk, especially of hemorrhage from separating the gall-bladder from the under surface of the liver. Opening the gall-bladder I remove a half-dozen stones, one fairly large, the size of the terminal phalanx of my index-finger, and stitch in a fair size drainage-tube, about as large as a No. 16 or 18 English catheter. I pack a small strip of iodoform gauze down to the incision in the common duct and close the wound, bringing out through the center of the incision the tube in the gall-bladder and the tube in the common duct and the small iodoform gauze wick (Fig. 162, *c*). I close the external wound in the usual way, using silkworm-gut sutures about an inch apart, putting in probably half again as many fixation sutures as we would use in an operation where the patient was a first-class surgical risk. I do this because wound repair will be slow here, and in all probability the introduction of a large number of fixation sutures will enable me to take them out by instalments, every other suture probably at the end of ten or twelve days, leaving the balance until I feel sure that wound repair is complete. The patient will be given 8 ounces of normal salt solution by rectum every three or four hours. If she continues to vomit, the stomach will be washed.

I am, of course, greatly gratified to find that she has no carcinoma of the pancreas or chronic interstitial pancreatitis, careful examination showing no evidence of either of these conditions. The operation necessarily carries with it a great deal of risk. On the other hand, if she recovers, she will be cured of the condition, I think, permanently.

It is not, I think, a good plan in doubtful cases such as this to guess at the diagnosis before the exploratory. I think this case illustrates that fact. In accordance with my theory of the probabilities deduced from the experience acquired in the handling of a large series of these cases, I think I would be inclined to favor in this instance, in view of the evidence, the diagnosis of obstruction of the common duct from a pancreatic lesion. The safer and better plan, I think, is for us simply to accept the fact in these uncertain problems that the symptom-complex can be due to one of a number of conditions, and that the only way we can tell definitely is to obtain the evidence that can only be obtained at exploratory operation.

Postscript.—I am glad to say that this patient did surprisingly well after operation and that no hemorrhage developed. There was very free drainage of bile, especially from the tube in the common duct, and some drainage from the tube in the gall-bladder. The iodoform wick was removed on the third day. Her temperature did not go above 100.5° F., and within a few days came down to normal. She vomited but once after the operation, so that it was not necessary to wash out her stomach. She had to be catheterized for a few days. A bowel movement was obtained at the end of seventy-two hours and she has proceeded to a very satisfactory recovery. The severe itching associated with the jaundice, of which she complained very bitterly before the operation, ceased entirely after the operation, in accordance with our usual experience, from drainage of bile in these obstructed cases.

The above postscript was written about two weeks after the operation, and the case seemed very favorable. At the end of that time the tube in the common duct was removed and for some days later the case continued to progress in a very satisfactory way. Then she had a severe attack of pain, chills, and a rise of temperature. Bile ceased flowing out of the external fistula and the stools became clay colored. The jaundice, which had largely disappeared, returned. I was for some days in the hope that the symptoms might be due to an edema of the mucous membrane—a cholangitis—but the condition was so persistent that at the end of about three weeks from the time of the first operation I did a second operation, and found, very much to my surprise, three stones in the common duct, one of these of considerable size, $\frac{1}{3}$ inch in diameter, and the others smaller, about the size of an ordinary pea. The larger stone was felt so readily that I cannot understand how it could have been overlooked at the first operation. It may have been in one of the hepatic ducts or in the gall-bladder, or low down in the common duct in the portion covered by the pancreas.

The second operation was not difficult technically, and was done rapidly, so I decided at that time to remove the gall-bladder, which I had not done at the first operation. I think, as the after-history shows, that this was a mistake. The patient did very well for a few days, and then began to bleed around the tube, and died about the fourth day from continued oozing from the under surface of the liver at the point from which I had detached the gall-bladder. We obtained an examination of the condition through the operative wound, which showed an extensive intra-abdominal hemorrhage. I think, without any question, this was a slow parenchymatous oozing such as occurs in these jaundice cases, and as I analyze the facts I think it was a mistake to remove the gall-bladder at the second operation. I am glad of the opportunity of presenting this postscript to complete the history of the case.

LARGE ULCERATING SARCOMA OF THE NECK

Summary: Management of malignant disease of the face and neck in which complete surgical removal is impossible—the combination of removal of as much of the growth as possible, starvation of the region by ligation of its arterial supply, and exposure to the *x*-ray.

The second case which I shall show you this morning is a patient who comes to us with a huge ulcerating malignant tumor of the side of the neck. She has consulted a number of surgeons and they have given her the opinion that the case was inoperable. The patient is a deplorable object. I shall show you the patient before we anesthetize her. The mass is as large as a good-sized cauliflower, about 8 or 9 inches from above downward and 6 or 7 inches from side to side, extending from the lobe of the ear down almost to the clavicle. It is at its thickest part 3 or 4 inches in thickness and in the center is a great big sloughing mass which produces an exceedingly foul odor. This patient refused an operation early in the development of this process, but recently has been very anxious to have an attempt made to remove this great ulcerating mass.

I have had a section removed, and the microscope shows that it is a small round-cell sarcoma. It is pretty evident that a radical operation gives little prospect of permanent cure in this case. I am going, therefore, to undertake what I regard as a palliative operation, removing this great ulcerating mass, getting rid of the foul odor, the danger of hemorrhage, and the toxemia that is associated with the absorption from such a large ulcerating malignant growth, and then, if the woman survives the operation, give her the benefit of the *x*-ray.

The patient is now anesthetized. We have sterilized the big ulcerating field with tincture of iodin as well as we can and the tissues about this ulcerating mass also with tincture of iodin. I shall first ligate the external carotid artery, the branches of which supply most of this tissue involved in the tumor mass.

In order to do this I have to make an incision in front of the tumor mass, push the tumor back over the sternocleidomastoid, and expose the carotid artery at its divisions into internal and external. I now find the external artery and assure myself that it is the external carotid by determining that coming from it are the large arterial branches, the superior thyroid, lingual and facial. I now ligate the external carotid just below the superior thyroid artery. This does not do away with the venous hemorrhage in the operation, but it assists very materially in controlling the total amount of blood lost. It is also of value in starving the tissues, making subsequent growth of the malignant process less rapid, and even making it possible to secure a greater effect from the *x*-ray treatment to which this area will be subjected.

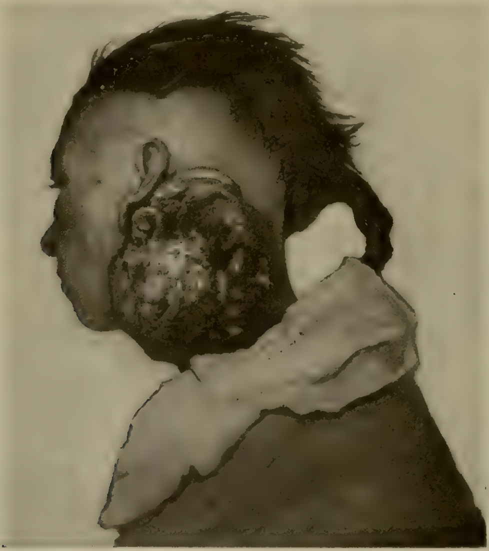

Fig. 163.—Huge ulcerating sarcoma of neck as it appeared just before operation.

I now rapidly dissect out this huge mass, leaving at the bottom of the wound deeply situated in the neck evidently some tumor tissue, which I cauterize very thoroughly with a large Paquelin cautery. The huge raw-surface is now covered with a layer of iodoform gauze, and over this I pack a large compress of simple gauze and put on a rather firm soft gauze roller, and over this a starch bandage.

Postscript.—The after-history of this case has more than justified the operation which we have undertaken. Very shortly after her recovery from the immediate effects of the operation, on the third or fourth day, we began *x*-ray treatments. The woman improved surprisingly after the removal of this great ulcerating mass. Her appetite returned and she gained 20 or 30 pounds in weight, and without any skin-grafting the greater part of this area has become covered in with normal epidermis. Compare photograph of lesion before operation and condition of patient at the present time (Figs. 163 and 164).

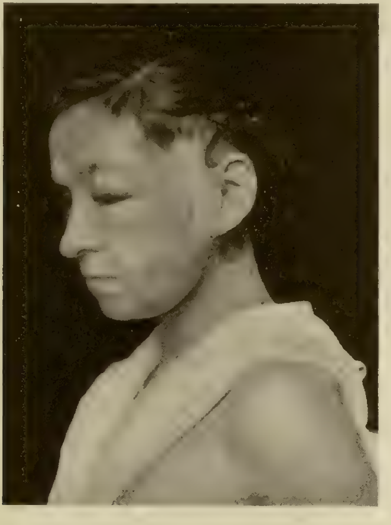

Fig. 164.—Patient two months after operation. There are no masses demonstrable in the region of the original tumor, but marked edema of that side of the head and face has appeared in the last few weeks, and a mass is now to be felt beneath the left breast.

You will see at a glance that it has been well worth while to give the patient the benefit of this surgical procedure, although there is even now, I think, no prospect of a permanent cure. We are doing in this clinic a large series of palliative operations for very extensive malignant processes about the head and neck, and the results have convinced me that it is our duty to give these patients the benefit of such surgical therapy. We are attacking them from the standpoint of cutting off their blood-supply and removing the gross lesion and of submitting the field of operation to x-ray and radium. There, of course, should be a very complete understanding with the family of the patient in a case of this kind. They should have explained to them the fact that the lesion is very far advanced and that the operation in all probability will be palliative, and where there is no prospect whatever of permanent cure the statement should be made that there is simply this possibility of permanent benefit. In talking with the patients themselves, however, after having had such a full and frank talk with the friends and relatives, I take a more optimistic view, and without urging the undertaking of the palliative operation, explain fairly fully the possibilities to them and make the statement that it will give them a fighting chance. The hopelessness, the mental depression of these cases that are told that nothing further can be done, that they are doomed to death from cancer, together with the hemorrhage, ulceration, foul odor, and cachexia make a most distressing picture. On the other hand, the improved mental attitude aroused by the hope of getting rid of the process, the general improvement after removal of the gross lesion, and the relief from pain which follow such an operation as this make a sharp contrast strongly in favor of giving the patient the benefit of the doubt and the benefit of the operation.

HUGE FIBROMA PRIMARY IN THE MESENTERY AT THE ILEOCECAL JUNCTION

Summary: A patient presenting an enormous solid tumor filling the entire abdomen—the probable diagnosis—operative findings—accidental wound of intestine necessitating resection; technic of abdominal closure; the mattress fixation suture; remarks on large abdominal tumors other than those arising from uterus or adnexa.

We have this morning a very unusual and very interesting problem in abdominal surgery in a case which has been under observation for some days, and one in which we have made the clinical diagnosis of a tumor either of the omentum or of the mesentery.

The patient is a young man of about thirty, who has been very well and very strong, and is even now in very good general condition. A few weeks ago he complained of some abdominal pain. He consulted a physician, who discovered that he had a very large, apparently solid tumor filling at least three-fourths of the abdomen—all of the abdomen, in fact, except a small part of the lower left quadrant.

Analysis of the symptoms shows practically nothing beyond some pain which he complained of some days ago and which has largely disappeared, and the existence of this large mass. There are no symptoms of obstruction of the bowel. There are no stomach symptoms. There are no symptoms referable to the liver or bile tracts or to the pancreas. The question of whether this large tumor can be associated with the right kidney has been very carefully gone into, the ureter on the right side catheterized, and the kidney found normal. There has been no blood or pus in the urine. There is no temperature. Examination of the blood shows that it is normal. There are no signs pointing to leukemia. The tumor, on examination, feels like a huge spleen except that it is located more on the right side than on the left. There is no transposition of the viscera.

I have thought of a number of possibilities in the case, as one naturally would in the case of a large tumor in this location. I thought first of a kidney tumor and then of a large tumor in connection with the liver. I have seen one case of huge simple cyst of the liver that occupied about the same anatomic position as this tumor, but as I have analyzed all the possibilities I am inclined to believe that Dr. Sippy's diagnosis of a large solid tumor either of the omentum or of the mesentery is the most probable. As to the character of the tumor, whether it is benign or malignant, we can, of course, express no definite opinion without examining it microscopically. There are no evidences of malignancy, the man's general health being excellent. On the other hand, we seldom find a tumor of this size in the abdomen that is benign.

I am going to make in this case a very large S-shaped incision extending from the ensiform cartilage downward and outward to the middle of the rectus muscle, and then split the rectus parallel with its fibers to a point several inches below the umbilicus, and then curve the lower part of the incision down toward Poupart's ligament, and divide the rectus completely in the lower part of the incision. This will give me a very large exposure and enable me to remove the tumor if it is found that this is possible.

The patient is now thoroughly under the anesthetic, and I am making the large curved incision which I have planned. Opening the peritoneum, I come down to this large tumor, which is adherent to the anterior parietal peritoneum. You notice that as I separate the peritoneum from the tumor there is a considerable amount of venous hemorrhage. The tumor is closely attached, as far as I can see by inspection, to the peritoneum of the abdominal wall. The hemorrhage is so free that I question in my mind whether we can remove this tumor and have the man leave the operating table alive. Anatomically what I find here reminds me very much of the conditions in a Talma operation, in cases of cirrhosis of the liver, where we plaster the omentum to the parietal peritoneum with the hope of obtaining a free anastomosis between the general systemic circulation and the portal circulation. We have here very much the same condition of affairs. There are large veins developed between this tumor and the peritoneum which probably connect with the portal circulation, on the one hand, and with the systemic circulation on the other. The man's general condition is so good and it seems so absolutely necessary to remove this tumor because of its huge size, compromising the viscera in the abdominal cavity, that I am going to make an effort to remove it even though this carries a good deal of risk with it. As you see, I am as rapidly as possible sweeping my hand in between the parietal peritoneum and the tumor and separating these adhesions. As I continue this separation I now reach a space in the left upper pole of the tumor where I enter the free peritoneal cavity.

I now rapidly free the tumor entirely from the parietal peritoneum, causing a very great deal of venous hemorrhage. Having the assistant press on the abdominal wall on either side, I am now delivering one margin of the tumor, and, as you see, I have delivered it entirely from the abdominal cavity. I rapidly pack some very large dry abdominal pads into the space from which I removed the tumor. As I lift the tumor into view you can see that attached to it is a very broad pedicle, and as I study the structures in this pedicle I find that they consist of the small intestine and of the large intestine adherent to the under surface of the tumor for a distance of about 5 or 6 inches. I should say that the tumor is probably 18 or 20 inches long, 12 or 14 inches wide, and about 8 inches thick. I clamp the pedicle of the tumor as close as I can to the tumor with, as you see, four or five strong curved artery forces. I divide the pedicle distal to these forceps and remove the tumor, so that I can complete the rest of the operation, which would be impossible otherwise. The venous hemorrhage, I am glad to say, has now ceased.

On careful examination of this pedicle I find that it consists of the ileum and cecum at the junction of these two structures. I find also that the part of the pedicle which I have divided opened the cecum for a distance of about 1 inch and the ileum for a distance of about 2 inches. It will, therefore, be necessary to resect this portion of the bowel. I do this more willingly because from the size of the tumor it is fair to suppose that it is a sarcoma, and we can in this way make the operation a radical one.

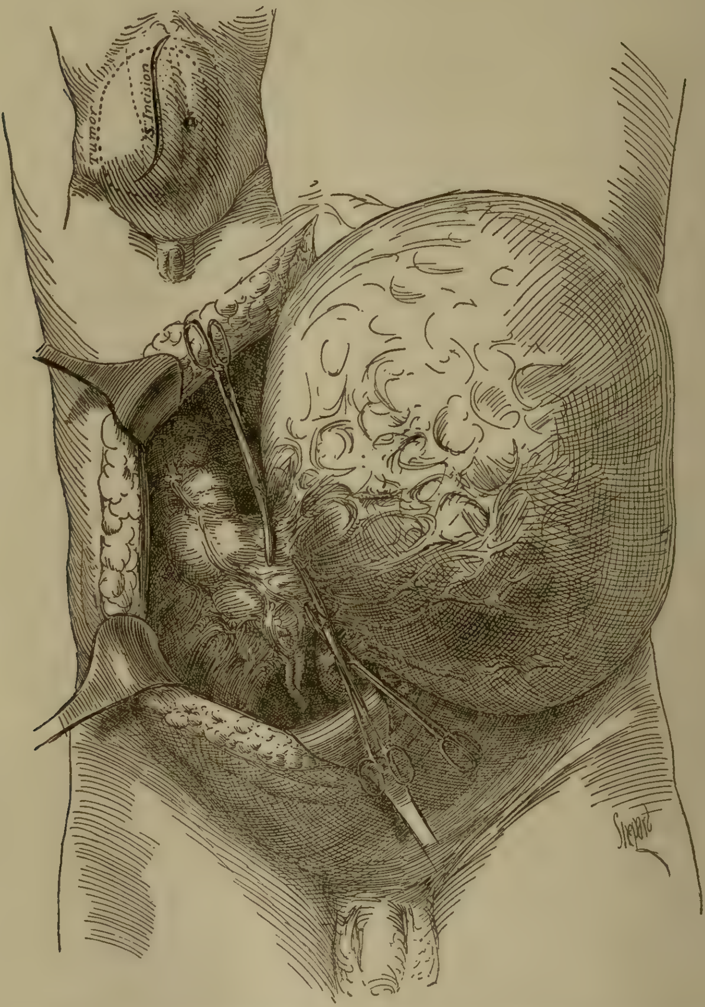

Fig. 165.—Tumor delivered and pedicle, attached to ileocecal junction, grasped by forceps preparatory to amputation. Outline of tumor and S-shaped incision on abdominal wall.

In resecting this portion of the bowel I first divide the external layer of the mesentery, which is avascular, and bring the cecum

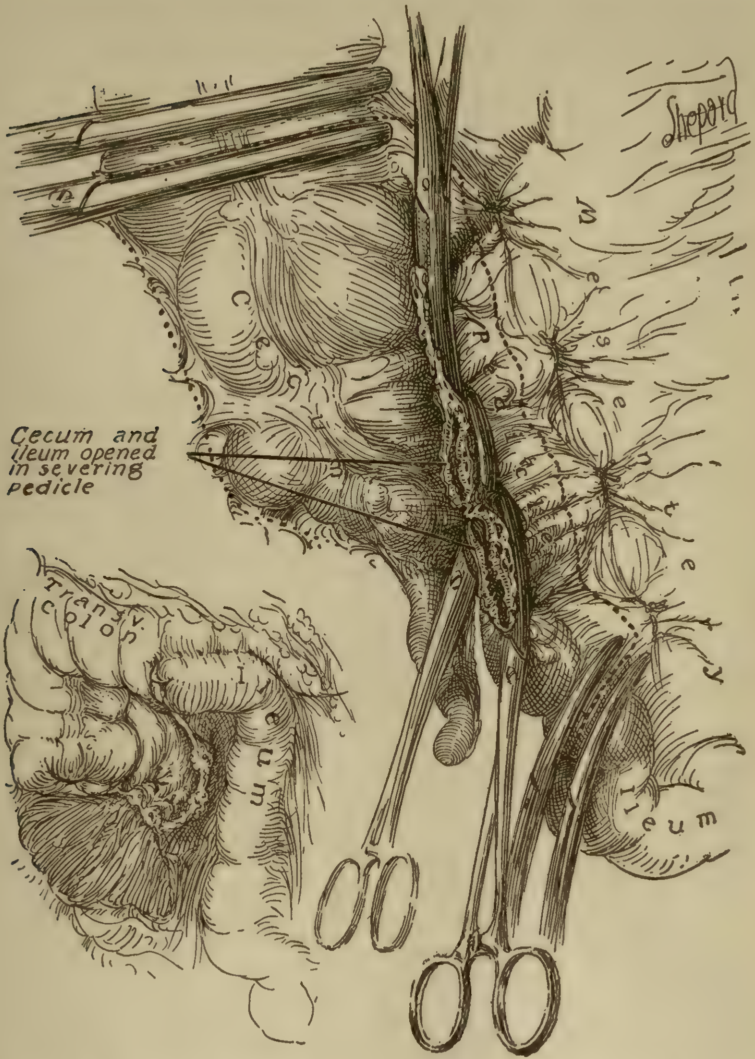

Fig. 166.—Pedicle containing portions of ileum and cecum which were cut through when pedicle was severed. Dotted line indicates incision for resection of injured area; lateral anastomosis of ileum to transverse colon shown in insert.

and lowest part of the ileum well into view. I ligate the mesentery of the last 4 or 5 inches of the ileum and of the cecum for 4 or 5 inches. Now, with intestinal clamps on the intestine in order to prevent the intestinal contents from pouring into the peritoneal cavity, I remove the 7 or 8 inches of the large and small bowel at the ileocecal junction. I close the cecum with three rows of sutures and close the ileum in the same way. I now make a lateral anastomosis between the ileum and the first part of the transverse colon. I do this because it is difficult for me to make an anastomosis with the small part of the ascending colon that remains. The operation has been so prolonged that I want to finish it as rapidly as possible. This lateral anastomosis is made

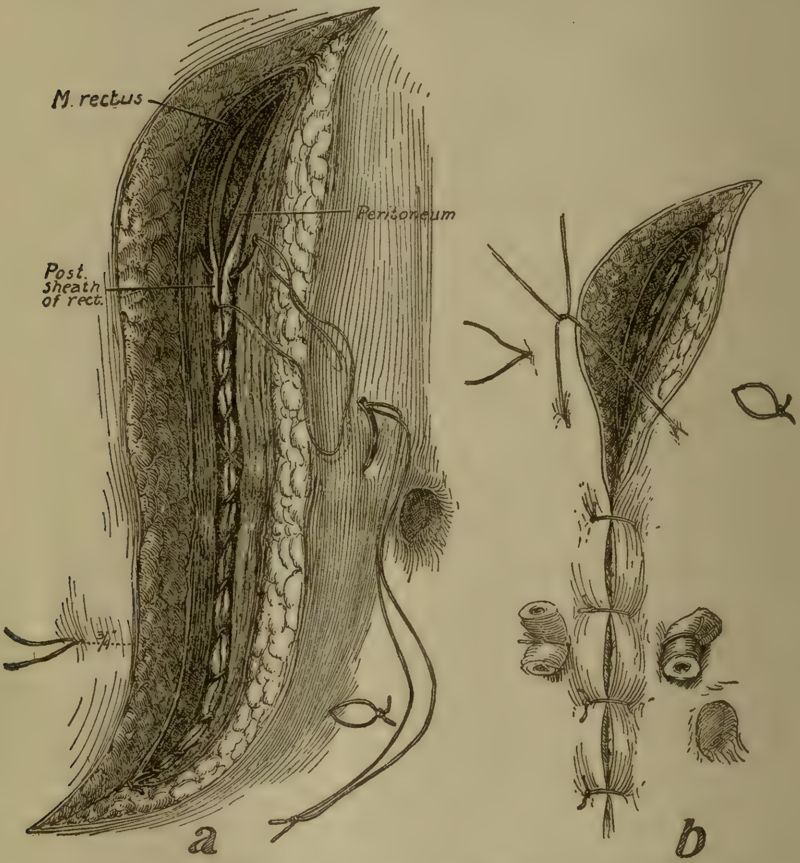

Fig. 167.—Method of closure of abdominal wall, illustrating especially the giant tension sutures.

with three rows of sutures and with clamps applied to both the large and small bowel in just the same way that you would do a gastro-enterostomy. The peritoneal cavity now is wiped free from blood-clots. A couple of cigarette drains are carried down to the point of this anastomosis, and the abdominal wall is closed in the usual way, with the addition of three large mattress fixation sutures, which I am employing in this case because of the great length of the incision. We are very fond of using these mattress sutures in a case of this kind and strongly advocate their employment. I want to call your attention to the way in which we use them. We take a strong piece of black waxed silk or silkworm-gut, which, of course, has been sterilized. As a matter of fact, it is the antiseptic waxed silk which was used in this clinic years ago by Moses Gunn, silk which has been boiled in wax to which 10 per cent. carbolic acid has been added. Then the silk is smoothed down and the extra amount of wax rubbed off with a sterile piece of gauze and kept in a protected jar for use. I use a rather strong piece of silk, as you see, taking a piece about 24 or 30 inches in length, doubling it and tying the ends together. The needle is now passed through all the layers of the abdominal wall except the peritoneum at a point $\frac{1}{2}$ to $\frac{3}{4}$ inch from the edge of the incision. In the loop formed by tying the silk together we place a little piece of cigarette drain on the opposite side. This mattress suture, as you see, demands the passage of the needle but once through the tissues and so gives you the best possible effect of the mattress sutures. We not infrequently employ this in operating for large postoperative hernias. We employ it in laparatomies on all large, stout people. We employ it also in operating on individuals who are anemic and run down, as carcinoma cases, where wound repair is slow and where it is desirable to maintain approximation by sutures for often a much longer time than the ordinary ten-day period. We also employ these same mattress sutures in cases of spontaneous reopening of the abdominal incision, where at the end of ten days or even twelve days, after the stitches have been removed, the abdominal wound opens up during some attack of coughing or vomiting, and the abdominal contents are forced into or out of the incision. In such a case we do not anesthetize the patient again, but simply infiltrate the edges of the abdominal incision with a local anesthetic, apothesin or novocain, and then pass these through-and-through mattress sutures, bringing the edges of the incision together as I have described. In this particular accident these mattress sutures are most satisfactory.

This patient is in very good general condition considering the protracted character of the operation and the great loss of blood. The tumor on cross-section is a great solid mass, either fibroma or fibrosarcoma. The microscope will have to determine the diagnosis.

As far as the after-treatment is concerned, it will consist in giving the patient 8 or 10 ounces of normal salt solution by rectum every three or four hours, washing out his stomach if he vomits, and the administration of a minimum amount of morphin if he has great pain.

I want to say a word or two in this connection in regard to the very large abdominal tumors that have been brought from time to time to our service. In children, as you know, most of these huge abdominal tumors are sarcomas of the kidney. In one case which we had three or four years ago a very large tumor filling the entire abdomen in a child proved to be a simple cyst of the liver, which filled the entire abdominal cavity, the liver being thinned out at its upper pole. Fortunately, we were able by sponge dissection to wipe the liver from the cyst and from the attachments to the peritoneum and remove the cyst, with the resultant entire and uninterrupted recovery of the patient.

We have had a number of huge abdominal tumors which proved to be hypernephromas with extension to the abdominal viscera, and, of course, many of these very large abdominal tumors on analysis proved to be enlargement of the spleen from one of several pathologic conditions. I am speaking now of large abdominal tumors which are not associated with the uterus or the uterine appendages.

Where a tumor fills the greater part of the abdomen and we cannot determine the anatomic starting-point by palpation, the case may present other evidence which enables us readily to make a diagnosis, as, for instance, in a kidney tumor presenting definite evidences pointing to the kidney of one or the other side, or in a huge leukemic spleen a blood examination may at once make the diagnosis clear. Inflation of the colon with gas and the determination of the relation between the colon and the tumor not infrequently gives valuable information. But many of these cases, as the case which we have just operated upon, cysts of the liver, cysts of the spleen, and even kidney tumors that are not associated with hemorrhage or other urinary disturbances, may be so obscure that we must frankly admit that the diagnosis is not possible without an exploratory operation. We should not employ exploratory operation as a means of diagnosis, however, until every other possible means has been thoroughly exhausted.

Postscript.—Microscopic examination of the tumor showed that it was a fibroma. The patient did not do well after the operation. He had a good deal of shock from hemorrhage and persistent vomiting. This was handled by washing out the stomach and by normal salt per rectum, but it continued, with dilatation of the stomach and with paralytic ileus, which proved to be fatal at the end of the fifth day.

In the light of the knowledge that I now have of the case—that it was a fibroma and not a fibrosarcoma—I have analyzed the facts carefully and wonder if it would not have been possible for me to remove the capsule of the fibroma without injuring either the cecum or the ileum, thus shortening the operation and preventing the necessity of a resection. On looking over the specimen, however, with a great deal of care I find that the ileum and cecum are so plastered to the under surface of the tumor that it would have been practically impossible to have carried out such a technic. There can be no doubt that in the removal of a huge tumor of this kind associated with very great hemorrhage and necessitating a resection of the intestines, there is a very great and unjustifiable risk to the patient. On the other hand, we are confronted with the fact that the continued rapid growth of this very large tumor would have produced such pressure on the abdominal viscera as to have been incompatible with life.

JEJUNAL OBSTRUCTION DUE TO ADHESIONS ABOUT SITE OF GASTRO-ENTEROSTOMY

Summary: A patient with abdominal distress greatly increased as the result of laparotomy with gastro-enterostomy; operation—restoration of the normal channels—rôle of the suture in the production of jejunal ulcer following gastrojejunostomy—probably a coincidence rather than a causal factor; necessity of preventing unnecessary operations—importance of co-operation between internist and surgeon.

I HAVE a very interesting case to present to you this morning, a woman of thirty-eight, who comes in with the following history:

She complains of more or less abdominal distress of vague origin and not very definite in character occurring on three or four different occasions, covering a period of about a year, necessitating the use of the hot-water bag, but not necessitating the use of morphin. She was seen by several physicians, one of whom diagnosed the case as gall-stones and advised her to have an operation. At the time of operation he found nothing wrong with the gall-bladder and proceeded to make an anterior gastro-enterostomy, for just what reason I am unable to say, as there seemed to be no history of pyloric obstruction and no definite history of either stomach or duodenal ulcer. Following the operation the patient gradually developed a great deal of stomach distress, and finally acute attacks of intense pain coming on after meals, sometimes daily, which required morphin for their relief.

After seeing a number of physicians she drifted into the hands of Dr. Sippy at the Presbyterian Hospital, who very carefully studied the case and analyzed the evidence. He was fortunate enough to examine her with a barium meal during one of these attacks. The pylorus was apparently patulous and there appeared to be a great distention of a loop of intestine, apparently in the loop employed in making the anterior gastro-enterostomy. This you will see very plainly in the *x*-ray plate which I will show you. In addition to these findings she also has a postoperative hernia at the site of the scar.

Dr. Sippy was inclined to make a clinical diagnosis of obstruction in the intestinal loop involved in the anterior gastro-enterostomy. He is willing to accept the possibility of an associated gall-bladder affair, and to this I am inclined to add as a possibility the postoperative hernia, on the theory that this may be associated with the obstruction in the loop. There are no earmarks of carcinoma or gastric or duodenal ulcer. The attacks are so frequent and so severe that the patient absolutely demands relief, and we shall make this morning an exploratory laparotomy to determine the condition and see if we cannot relieve the symptoms.

Under ether I am excising the abdominal scar over the site of the hernia and find a very distinct hernial sac, projecting into the space between the skin and the abdominal muscles. I shall first separate this peritoneal sac and remove the excess of peritoneum, leaving just enough to make a good closure. Projecting into this space you see a distended, rather stiffened coil of small intestine, rather unusual in appearance, not the flaccid appearance of the ordinary jejunum, but the appearance of a coil of intestine that is contracting and attempting to empty itself. As I lift this into view I find that this coil extends from the beginning of the jejunum to the gastro-enterostomy opening, with evidence of hypertrophy of its musculature. At the gastro-enterostomy opening the intestines are matted together by large masses of adhesions, twisted and occluded by these adhesions in such a way as easily to produce obstructive symptoms (Fig. 168, *a*). Lifting up the pylorus and duodenum I find no evidence of any thickening suggestive of either ulcer or carcinoma. I now examine the gall-bladder and ducts and find that the gall-bladder is normal in appearance, and that I can readily empty it, and I find no stones either in the gall-bladder, cystic or common ducts. It seems to me that the indications are here very plain, that is, that the symptoms which she has been suffering from are due to an obstruction in the loop of bowel extending from the jejunum to the anterior gastro-enterostomy, and that this condi-

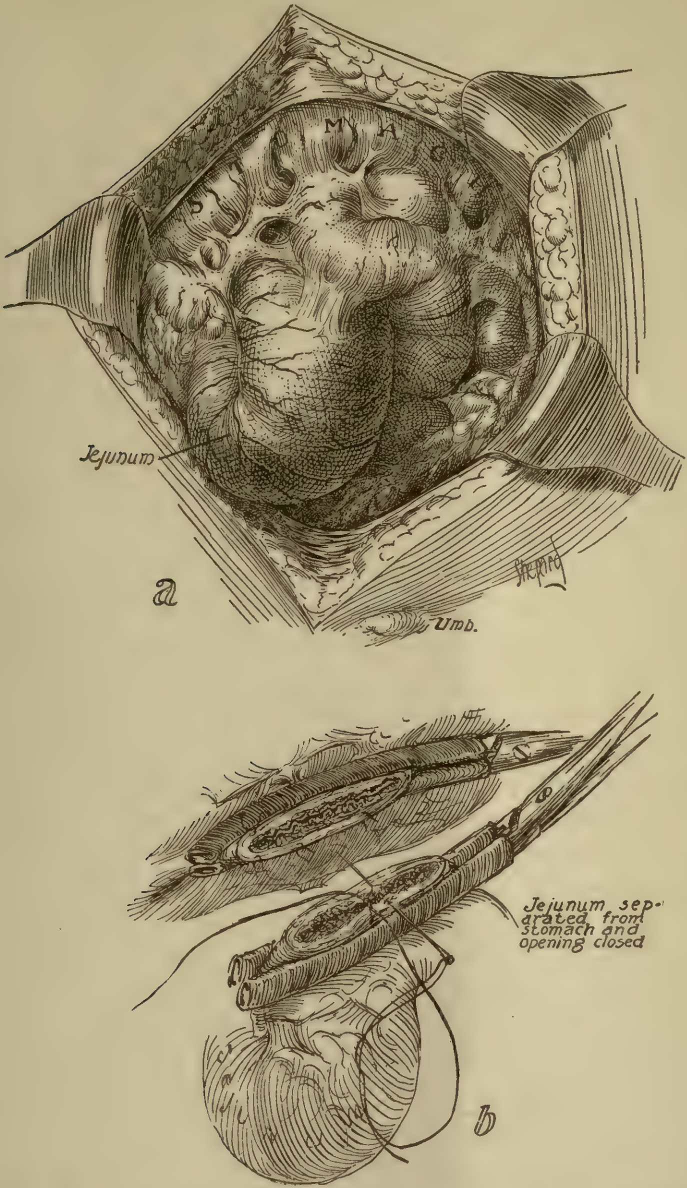

Fig. 168.—*a*. Abdomen opened, exposing obstructed loop of jejunum and surrounding adhesions. *b*. Re-establishment of natural channels by cutting through site of old gastro-enterostomy and closure of gastric and jejunal openings.

tion can be corrected by separating the bowel from the stomach, closing carefully the opening in each viscus, and restoring conditions to normal.

I now separate the adhesions around the gastro-enterostomy opening, and you see it has taken fifteen or twenty minutes before we can separate these so as to see clearly the entire line of attachment between the stomach and bowel. I now place a rubber-protected clamp on the stomach and one on the jejunum so as to prevent any of the stomach or intestinal contents from escaping, and carefully separate the stomach from the intestines. In doing this we want to be sure to make the separation in the mucosa at exactly the line of junction of stomach and intestinal mucosa. If you keep this matter in mind it is not difficult to do this, and to distinguish between the smooth stomach mucosa and the folds of the intestinal mucosa. I have now completed the separation and shall suture the intestinal mucosa with one layer of linen suture and then bring together the muscularis and peritoneum, and finally a third Lembert layer, which, as you see, I put in after I remove the clamp from the intestine, as in this way we can make a more accurate approximation and see distinctly whether there is any hemorrhage (Fig. 168, *b*). I want to call your attention to the fact that I am using a very fine cambric needle and quite fine linen, and that the linen has been run through sterile vaselin so as to make it perfectly smooth and does not tear the tissues as it is pulled through the coats of the bowel. This is simply a little step in the technic that I regard as exceedingly important.

I want to call your attention to the fact that the original gastro-enterostomy was made with large black sutures and that these can be readily seen projecting into the bowel, and also another row of sutures seen interruptedly under the peritoneum. There is, however, no evidence of a jejunal ulcer at this point. I am rather inclined to believe that where large massive threads like this are employed they remain hanging permanently in the gastro-enterostomy and that they do not very often give rise to trouble. Dr. Will Mayo is inclined to attribute the development of jejunal ulcers to these sutures. It is possible that they are etiologic factors. On the other hand, I think that where we undo a large number of these gastro-enterostomies, as we are doing this morning, we would find fairly constantly threads present and jejunal ulcers not present, or else in a very small percentage. I am personally more inclined to regard the threads as incidents and possible factors in jejunal ulcer than as essential factors, and to attribute the development of jejunal ulcers to the continuation of the high acidity and corrosive effect of the gastric juices at the point of the gastro-enterostomy, which then, anatomically, is situated in relation to this corrosive effect in exactly the same situation as the first part of the duodenum, where peptic ulcers so frequently develop.

I am now closing the opening in the stomach in the same way with three rows of sutures. I carefully wipe off with moist sponges both the bowel and the stomach, removing here a little blood-clot, and then drop both the stomach and intestines back into the abdominal cavity and close the wound without any drainage.

I am very glad to be able to show you this case, because it is one of a considerable series of similar cases that we have had on our service. I think that we are probably not having these sent to us as frequently as we did a few years ago. There is a certain moral to be learned from a case of this kind. Here is a woman who has an exploratory operation for some uncertain abdominal distress, and the surgeon then performs what seems at this time with the evidence we now have an unnecessary gastro-enterostomy. This operation produced infinitely more trouble than she had ever had before, and another operation is required to undo the gastro-enterostomy and to restore the alimentary canal to its normal condition. Some years ago I think in almost all clinics too many gastro-enterostomies were done and many gastro-enterostomies done without any clear indications. Today on our service we are demanding very definite reasons for doing a gastro-enterostomy, and these reasons must be demonstrable, gross, tangible, and unmistakable. There was a time when the surgeon would make a diagnosis of gastric or duodenal ulcer, or his medical colleague would make this diagnosis, and a gastro-enterostomy would be agreed upon, and at the time of operation if no definite, gross evidence of ulcer was found, they would at times nevertheless go ahead with the gastro-enterostomy on the basis that the ulcer might be small, limited to the mucous membrane, and of such character that it could not be felt by the palpating finger. Then the surgeon would go ahead with the operation on this line of reasoning because in his opinion the clinical evidence of ulcer was sufficient to warrant the procedure. I do not think that this should any longer be done. In many of the cases where an unnecessary gastro-enterostomy is made the patient may not suffer from the resulting deformity, but certainly in a very large proportion the patient suffers more or less distress, and in some cases very marked distress, as in this particular case.

I have seen so many unnecessary operations on the stomach and the intestines, gastro-enterostomies, ileosigmoidostomies, resections of the colon, etc., where the patients were not only not benefited by the operation, but very greatly injured by it. I have come to take a very definite stand against these operations when they are unnecessary and against the doing of this work by incompetent and unreliable surgeons. At the last meeting of the American Surgical Association in New York I presented a paper incorporating some of these views before the surgical section. The paper was entitled, "Unnecessary Operations by Incompetent Surgeons." One of the conclusions which I have arrived at is that there will be less of this unnecessary work if these cases are handled jointly by a good internist and an operating surgeon. I think we have advanced far enough in the study of these cases to warrant our taking the position of demanding gross evidence of obstruction before we undertake any of these anastomosing and side-tracking surgical procedures.

In closing the abdominal wound we must take great care to prevent a recurrence of the postoperative hernia, and I want particularly to call your attention to the technic which we have learned to employ in these cases. We close, as you see, the peritoneum by moderate size catgut suture, and then I introduce, about an inch apart, mattress sutures of silkworm-gut. Those of you who were at my last clinic saw me employ this method of suturing, closing a very large abdominal incision for the removal of a huge fibroma developing from the mesentery at the junction of the cecum and the ileum, and you will remember that I described the use of these large mattress sutures in detail at that time. In this case we shall use these mattress sutures, tying them over a small piece of cigarette drain. I am closing the anterior sheath of the rectus with catgut and the skin with a fine black silk. One word of caution in regard to the removal of these sutures. Our usual routine is to remove the silk at the end of about the ninth or tenth day, every other one of the mattress sutures about two days later, and then about two days later, that is, at the end of the thirteenth or fourteenth day, the balance of the sutures are removed, care being taken, however, to strap the whole abdomen at this point firmly with adhesive straps.

Postscript.—I am glad to say that the patient made an uneventful recovery and had no vomiting following the operation, that the old pains due to the obstruction in the jejunum disappeared entirely and have not recurred, and she has made an excellent recovery, showing that the anterior gastro-enterostomy with its adhesions was responsible for these attacks.

CLINIC OF DR. GUSTAV KOLISCHER AND DR. J. S. EISENSTAEDT

MICHAEL REESE HOSPITAL

URETERAL STONE

Summary: Scientific diagnosis of ureteral calculi; analysis of the methods employed and the logical deductions from each step of the examination; treatment—ureterotomy a last resort—when permissible; endoscopic methods—the theory of their application; practical results.

THE patient under consideration reports that about a year ago he was taken with sudden pain in the right epigastric region and that these pains were of a colicky character and radiated downward into the penis. The pains were severe from the onset and increased in intensity almost beyond endurance, and then by degrees abated until they finally subsided.

The urine passed after this attack was stained a dark red.

Inside of a few days the urine cleared up. The right flank, however, remained the seat of uneasiness for about a week.

The patient felt well until about three days ago, when he again was seized with an attack similar to that previously mentioned, showing this time, however, the change in the site of the pain from the right epigastric region to the right hypogastric region. The irradiation of the pain was mainly felt alongside the right inguinal canal, down into the right half of the scrotum. The urine passed after the onset of this attack was slightly turbid and has remained in this condition up to the present. The right hypogastric region is still the seat of a dull ache, and palpation of this area shows it to be sensitive. Increased frequency of urinary calls is reported. The patient presents himself for relief.

The routine examination of the chest and abdomen does not lead one to any definite conclusion, so we proceed to more specialized investigation. The location of the pain and the urinalyses naturally would direct our attention to the uropoietic system. The analysis of the urine does not show any abnormality in regard to the elimination of solids, while the microscopic examination reveals the presence of a few red blood-cells, numerous leukocytes, epithelial cells, and some nondescript débris.

In order to determine the provenience of these pathologic admixtures we now turn to the direct examination of the bladder, ureters, and kidneys, that is, to the instrumental and ocular revision of this entire tract. This is accomplished by cystoscopy and ureteral catheterization.

While the inspection of the urinary bladder will clear up the situation as to the condition of this viscus, the special observation of the ureteral openings and the employment of the ureteral sounds and catheters will furnish additional information as to the patulence of these tubes, and by collecting the urine separately from either kidney diagnostic pointers concerning the condition of these latter organs may be gleaned.

Cystoscopy shows the vesical mucosa to be normal. The same holds good of the left ureteral mouth, while the right one appears to be rounded out and pouting, its edge appearing to be somewhat edematous. The urinary whirls emanating from the left ureteral mouth seem to be more active than those on the right side.

On the left side the ureteral catheter passes up into the renal pelvis without any difficulty, and after it is withdrawn there is noted rhythmic ejaculation of urine. On the right side the catheter is arrested at a point about 10 cm. above the vesical opening of the ureter. Under pressure the catheter overcomes the obstacle with a slight jerk and glides upward. When the obstruction has been passed a rapid trickling of urine is observed from the distal end of the catheter. After this gush stops regular rhythmic ejections of small quantities of urine are noticed. Both catheters are now withdrawn and renal and ureteral *x*-ray pictures are taken.

The left side does not present any apparent abnormalities in the roentgenogram and the right kidney does not show any pronounced shadow within its contour, but near the edge of the iliac bone a shadow of oblong shape and of somewhat irregular outline is seen.

A shadowgraph catheter is now passed into the right ureter beyond the point of the obstruction found at the time of the first catheterization, and again encountered during this latter sounding, and another *x*-ray picture of the lower urinary tract of this side is taken. In this picture the above-mentioned shadow appears again and it is also noted that it is in close apposition to the shadow produced by the opaque ureteral catheter.

The analysis of all the observations quoted will permit the following conclusions:

There is no abnormality traceable to the left kidney and ureter. The right kidney is also evidenced as non-pathologic. In the right ureter an obstruction apparent to the tactile sense is met. Its presence is further accentuated by the accumulation of urine in a distended sector of the ureter, which phenomenon is always noticeable above a narrowing of ureteral lumen produced by an intra-ureteric obstacle. That this distention is limited to a small sector only is proved by the fact that after the catheter has overcome this obstruction and the urine accumulated in this pouch is evacuated the regular ejaculations of the ureter are resumed. That this was and is caused by a foreign body inside of the ureter is made evident by these facts: the catheter meets an obstacle, and at the site of its arrest there appears in the second *x*-ray plate a shadow in intimate contact with the shadow of the opaque catheter. There is no doubt that we have to deal with a urinary concretion arrested inside of the right ureter at this particular location, a ureteral calculus that only partially occludes the lumen.

The abnormal admixtures to the urine collected from the right side and the subjective symptoms form an appeal to the surgeon to remove the foreign body which causes the obstruction, and it remains to discuss and to choose the method to be employed.

Ureteral stones may be removed either by endoscopic methods or by ureterotomy, that is, the bloody exposure and opening of the ureter. It requires no argument to prove the contention that the procedure which necessitates no previous destruction, if effective at all, will have the preference over a procedure which calls for operation with a knife and which includes all the risks incurred by any operative interference.

The mechanical removal of intra-ureteral stone above its intramural end may be accomplished by loosening the concretion by touching it with ureteral sounds and injecting some lubricating fluid through a ureteral catheter, beyond the stone if possible, and by continuing the injection while the catheter is slowly withdrawn. By this procedure the ureter is dilated, its inner surface is lubricated, and contractions are elicited which further the delivery of the stone. Or a ureteral catheter, the eye of which is hermetically sealed by a piece of very thin rubber tissue, is passed up to the stone. Air is then forced into the catheter, ballooning the eye cover. By now withdrawing the catheter its thickened end dilates the ureter beneath the calculus and the stone will follow the catheter in its descent. If repeated attempts of this kind fail and the objective and subjective symptoms become urgent, ureterotomy is to be considered.

In analyzing the history of this case one may assume that the original attack was caused by a stone in the pelvis of the kidney. This is indicated by the location of the pain which was caused by the forcible contractions of the renal pelvis in its effort to expel the stone, which, due to its raw surface and accidental change of position, irritated the lining of the pelvis. The appearance of blood may be explained by the traumatism inflicted on the mucosa and by the milking out of this membrane by the forcible contractions of the pelvis.

The statistic experience that practically all the concretions found in the ureters are of renal origin strengthens further the above-mentioned conclusion. The reappearance of an attack in which the subjective symptoms are quite similar to the first one suggests the delivery of the renal calculus into the ureter and its dropping down until it was arrested either by a change in its position or by becoming impacted in one of the physiologic narrowings of the ureter—in this instance, in the one near the pelvic brim. The arrest of the stone and its lodgment in one place for a long time may lead to an increase in the size of the calculus by apposition of urinary salts. This phenomenon explains, in turn, the fact that the stone remains in the same location and increases the obstruction, leading to a partial distention of the ureter just above it, which temporary sacculation becomes filled with urine. That this calculus did not lead to complete occlusion is proved by the continuance of urinary ejaculations from the ureteral mouth, though diminished in number and energy. This partial patulence of the ureter is explained by the fact that the stone by virtue of its shape and size does not completely fill the lumen. The disappearance of blood from the urine is explained by the freeing of the pelvis from its extraneous contents, while the débris in the urine is evidently derived from the affected part of the ureteral wall, kidney elements being absent from the specimen. This assumption is made more plausible by the fact that ureteral calculus in its travel downward and in its arrest at the place finally located did not cause any acute subjective symptoms until the trauma to the ureteral sector in question reached such a degree as to excite definite reaction and forcible contractions perceived as colicky pains.

The selection of the therapeutic measures to be used in cases of ureteral stone must be determined with care and deliberation. The main consideration should be, Is the risk of a surgical intervention out of proportion with the gravity of the pathologic condition to be remedied?

It is a matter of statistical experience that about 80 per cent. of all ureteral concretions sooner or later are spontaneously evacuated into the bladder, from whence they are expelled either with the urinary stream or may easily be pumped out by means of an evacuator. It is, furthermore, a matter of record that ureteral catheterization and lubricating and dilating the ureter by injection and inflation will bring down to the bladder most of the concretions. Exceptions to this rule are those stones of excessive size, or instances in which the calculus becomes impacted inside of the vesical end of the ureter.

When one considers that the exposing of the ureter in its abdominal course is always a preliminary operation of great dignity, that denuding the ureter in any great length implies the danger of necrosis of its wall, that subsequent to the ureterotomy adhesions may be formed, which may lead to a permanent kinking of this tube, and that in quite a number of cases permanent ureteral fistulæ may result, the conclusion will force itself into the foreground that ureterotomy is to be reserved for the most urgent cases. It is necessary to be absolutely certain of the diagnosis and location of the stone, the latter in order to avoid unnecessarily extensive denudation of the ureter; therefore the operation must follow promptly the taking of a decisive *x*-ray picture, because ureteral concretions may change their location very quickly and unexpectedly. Only if repeated attempts at dislodging the stone by endoscopic methods have failed and if the kidney becomes tender and the quality of the urine deteriorates, or if reflex anuria sets in, or if the size of the stone makes endoscopic delivery impossible, ureterotomy *in continuate* should be resorted to.

In case the ureteral concretion becomes impacted inside of the intramural (vesical) part of the ureter the indications will vary according to the peculiar features of the case. If the calculus already protrudes partially into the bladder it may be delivered by using an alligator forceps through an operating cystoscope. If the constriction around the stone be too tight it may be relieved by the use of scissors used through this same instrument. If the concretion should be too large for endoscopic manipulations or if they should by chance fail, the bladder is opened and the stone readily removed. Cystotomy represents an interference of minor importance, and the surgical risk may be further reduced by the employment of local anesthesia.

The direct clinical diagnosis of ureteral stone is based on several essential points: first, one must demonstrate that a partial or total obstruction of the ureter is present; second, one must show that this obstruction is caused by a foreign body within the ureteral lumen; third, it must be shown that the consistency of this foreign body is that of a urinary calculus.

That an obstruction is present is strongly suggested if the ureteral sound is arrested at the same point several times during a single séance. This suggestion becomes a certainty if a metallic click is heard when the sound impinges on the obstruction. The metallic click is rendered plainly audible by the attachment of a resounding disk to the distal end of the sound. The use of a wax-tipped catheter has been suggested for the discovery of ureteral stones, the argument being that scratches on this impressionable substance will prove the presence of a concretion. Divisions on this catheter are marked off by alternating black and red segments 1 cm. in length, and these are intended to place accurately the exact location of the calculus. But these calculations are subject to certain exceptions. For example, a calculus may be covered with débris to such an extent that a wax-tipped catheter in reaching it may not be scratched at all, or a stone resting in a sacculation of the ureter may permit the tip to pass by without touching it. On the other hand, the wax tip may sustain scratches while passing through the cystoscope, which likewise may give misleading information.

As to shadows appearing in the roentgenogram in the ureteral region, it may be said that shadows of very regular outline probably are due to phleboliths or calcified lymphatics, while those cast by ureteral stones are usually oblong and present an irregular outline. Plates taken at different times and showing change in location of shadow point to the presence of intra-ureteral concretions. To further insure oneself that he is dealing with an intra-ureteral shadow the following technic may be carried out: At the time of the first introduction of the shadowgraph catheter a small quantity of some contrast fluid—collargol, silver iodid, or thorium—is permitted to flow in slowly through the catheter into the ureter. The catheter is then withdrawn and another *x*-ray plate is made after the lapse of forty-eight hours. During this time the urinary flow will have washed the contrast fluid out of the ureter, while in the event of a urinary calculus particles of the contrast fluid will become deposited on the surface and make its outline very much more distinct in the second *x*-ray plate.

The diagnosis of calculus impacted in the intramural part of the ureter offers no great difficulty. The information derived from a complete *x*-ray examination may be augmented by cystoscopic investigation. If the beek of the cystoscope is pushed far into the fundus of the bladder the intramural part of the bladder is transilluminated and the concretion will then appear as a dark shadow within an area of light, bright red. A stone that partially protrudes into the viscus is easily recognized, and any possible doubt may be cleared by introducing a sound through the channel of the cystoscope and touching the suspected body with the sound.

CLINIC OF DR. FRANK SMITHIES

Augustana Hospital

CASES ILLUSTRATING DISEASE OF THE GALL-BLADDER AND THE CONSIDERATION OF 1000 CASES OF GALL-BLADDER DISEASE

PART I

Case 1. Acute Catarrhal Cholecystitis in a Young Girl, with Subsidence of Primary Attack and Later Operative Interference for Chronic Catarrhal Cholecystitis ("Strawberry Gall-bladder").

Case 2. Long-continued Stomach Trouble Intermittent in Character, Later Constant and Complicated by an Acute Crisis Associated with Chill, Fever, Sweat, and Jaundice. Pathologically, Cholelithiasis, Empyema of the Gall-bladder with Gangrene.

Case 3. A Young Adult Female in Whom Tonsillitis and Abscesses About Carious Teeth were Rapidly Followed by Dyspeptic and Mild Gall-bladder Distress. Pathologically, Marked Cholecystitis with Cholelithiasis.

Case 4. An Adult Male with a Two-year History of Intermittent "Stomach Trouble" of Ulcer Type, Terminating with Duodenal Stenosis. Pathologically, Cholecystitis, Adhesions to Duodenum, Protected Perforation of Large Gallstone into Duodenum, Duodenal Ulcer.

Case 5. A Six Weeks' History of Dyspepsia Associated with Pyloric Obstruction, Weight Loss, Cachexia, and Right Upper Quadrant Tumor. Pathologically, Carcinoma of the Gall-bladder, Cholelithiasis, Secondary Involvement of Stomach and Colon.

Case 6. A Patient Appearing with Rapidly Enlarging Lower Abdominal Tumor. Pathologically, Ovarian Cyst and Large, Thick-walled Gall-bladder Containing Many Stones.

PART II

Clinical Consideration of Gall-bladder Disease Based Upon an Analysis of 1000 Pathologically Demonstrated Instances of the Affection.

Part I

Eight years ago MacCarty[1] demonstrated, pathologically, that gall-bladder disease is a form of inflammatory tissue reaction similar in every way to such tissue reaction in other hollow abdominal viscera. Six years later Rosenow[2] showed the frequent bacterial etiology of such inflammation. He appeared to prove that bacteria are commonly first carried to the gall-bladder by way of the blood-stream, and that when such are found in the contents of the gall-bladder they have been cast off from the wall of the viscus as inflammatory by-products. Recently, from the surgical viewpoint, Fowler[3] has emphasized the progressive, inflammatory features of gall-bladder ailments, and, with a similar conception, Cheney[4] has studied 56 cases.

It is unfortunate that the above-mentioned facts that have been established by bacteriologists and which have occasionally been emphasized by clinicians have not as yet received proper recognition from practitioners in general, or even internists and surgeons of large hospital experience.

It is common in this clinic, as it is in others, to have instances of gall-bladder disease brought for examination or treatment with diagnoses, not rarely professionally given, of "dyspepsia," "indigestion," "hyperchlorhydria," or "peptic ulcer." It is by no means uncommon to have such patients give histories of long-continued courses of treatment directed toward the relief of anomalies supposed to be primary in the stomach. Many such patients have had various types of "medical ulcer cure," only to eventually be demonstrated at laparotomy, and later pathologically as instances of long-standing gall-bladder disease. This is especially the case in individuals below the age of thirty years, in whom it is common practice to ascribe any digestive upset associated with the symptom of "hyperchlorhydria" as being due to peptic ulcer. It has not as yet become generally disseminated knowledge that true peptic ulcer is a rare finding at laparotomy or autopsy in individuals below the age of thirty, nor has it been sufficiently emphasized that in the young especially so-called hyperchlorhydria symptoms do not, of necessity, mean increased acid in the stomach. Abundant evidence at hand establishes the fact that many symptoms of so-called "hyperacidity" are merely manifestations of abnormal motor activity on the part of the stomach—pyloric spasm, gastric spasm, spasm at the cardia, or the regurgitation of normally acid gastric contents into an esophagus accustomed to harbor material that is alkaline or, at the outside, neutral in reaction.

The relationship of progressive infection of the gall-bladder, whether such infection be acutely and continuously progressive or chronically, continuously progressive, or chronically and intermittently progressive, with respect to its effect upon the tissues forming the gall-bladder, the contents of the gall-bladder and the mechanical function of the viscus are observations which require broader circulation than has yet been given to them.

The cases presented here briefly attempt to show the relationship of inflammatory affections of the gall-bladder with regard to clinical symptomatology and associated pathologic changes in the gall-bladder.

Case 1. Acute Catarrhal Cholecystitis in a Young Girl, with Subsidence of Primary Attack and Later Operative Interference for Chronic Catarrhal Cholecystitis ("Strawberry Gall-bladder").

This patient, a young nurse aged twenty-six, appeared for examination about four months since. At that time, following an attack of la grippe, there had occurred sudden, severe, cramp-like pains in the right upper abdominal quadrant. Temperature rose to 99.5° F., but there were no chill, sweat, or jaundice. The urine was normally colored. Within a few hours following the pain there was pronounced nausea followed by frequent vomiting of yellowish-green fluid. The bowels were constipated. The abdominal examination revealed tenderness along the right rib edge, but was otherwise normal.

By rest in bed, rectal feeding, gastric lavage with hot salt solution, and an ice coil locally to the right upper quadrant the attack subsided within three days and the patient was permitted to return to duty inasmuch as she looked and felt entirely well. It is not uncommon in practice to term these attacks "acute indigestion."

Two weeks ago this patient experienced a drawing or dragging sensation in the upper right abdominal quadrant, and this distress has been constant. At times the distress has been punctuated by sharp, colic-like pain without any area of transmission. There have been much gaseous distention in the epigastrium and a feeling of crowding about the heart, violent belching at times, some nausea, but vomiting only once. The vomitus was greenish yellow and small in amount. The bowels have been constipated, the appetite poor.

The abdominal examination when the patient was first seen revealed nothing abnormal other than tenderness along the right rib edge, dulness on percussion over the theoretic gall-bladder zone, and gaseous distention of the cecum and ascending colon. The stomach showed no retention, free HCl was 30, the total 46, the *x*-ray plate negative, stools contained hydrobilirubin, and there was no bile present in the urine. The white count was 11,000, of which 76 per cent. were polynuclears.

On account of this patient's constant distress and the interference with her occupation, and in view of the past history and present local findings, exploratory laparotomy was advised.

Laparotomy disclosed a greatly distended gall-bladder, 250 c.c. of thick, brown, mucoid bile containing much granular material being drawn off through a trocar. The walls of the gall-bladder were edematous, the mucous membrane thickened, and presenting a strawberry-red appearance. The lymph-nodes along the common bile-duct were greatly enlarged and there were found adhesions between the gall-bladder and the duodenum. The appendix was chronically inflamed. Cholecystectomy and appendectomy were performed.

The above case would appear to emphasize the relationship of a grippal infection toward the production of a cholecystitis, the subsidence of the acute infection, but the steady onward progress of the inflammatory changes so that within a few months mechanical interference to the free emptying of the gall-bladder resulted with consequent distention and aggravation of gall-bladder embarrassment. The early changes in the bile, together with the presence of sand-like subsidence as well as the lymph-gland involvement along the common duct and the fine adhesions between the gall-bladder and the duodenum, are tangible evidences of the invasion of infection into surrounding structures.

Case 2. Long-continued Stomach Trouble Intermittent in Character, Later Constant and Complicated by an Acute Crisis Associated with Chill, Fever, Sweat, and Jaundice. Pathologically, Cholelithiasis, Empyema of the Gall-bladder with Gangrene.

This second patient, a married woman aged thirty-four, who has borne two children and in the past has been affected with measles, smallpox, and pneumonia, was apparently well until ten years ago. She then experienced attacks of stomach trouble coming on several times a year. These attacks would last from a day to a week or so. In the attack the patient experienced nausea, pain in the epigastrium, gaseous distention, and would occasionally vomit. The epigastric distress never amounted to severe pain. It was usually relieved by hot applications, limitation of food, and emptying the bowels.

Two years ago the patient experienced a sharp, stabbing pain along the right rib edge. The pain radiated through to the back, came on suddenly, and required morphin for its relief. There were no vomiting, chill, fever, sweat, or jaundice. These attacks have been very frequent since that time, and have come on once every three to five weeks. Two months ago there was an especially severe attack, accompanied by vomiting of very sour fluid and possibly a slight icteric tint to the sclera. The attack was relieved by initial doses of morphin, followed by fasting and catharsis. Since the last severe attack there have been sour eructations immediately after eating, epigastric burning, and some nausea. The distress has been relieved by frequent doses of bicarbonate of soda.

Just before entering the hospital a week ago, shortly following the evening meal, there were rather pronounced right upper quadrant distress, but not nearly so severe as had been previously experienced, some retching, but no vomiting, and a feeling of "being sick all over." The patient was brought to the hospital and the temperature found to be 102.4° F. and leukocytes 18,000, of which 86 per cent. were polynuclears. There was right upper quadrant distention, spasm of the right rectus, dulness to percussion over the right upper quadrant, and gaseous distention of the colon. There was no jaundice, the stools contained bile-pigment, and the urine was free from bile-coloring.

Laparotomy (which appeared to be urgent on account of previous attacks, suddenly developing temperature, with leukocytosis and the right upper quadrant distention, with marked spasm of the rectus margin) disclosed a greatly distended gall-bladder, fiery red in color, with large, inflamed glands about the cystic and common ducts. At aspiration nearly a liter of foul-smelling pus flowed from the gall-bladder. The mucosa of the gall-bladder was gangrenous in patches, and toward the cystic duct lay two large gall-stones. A portion of the gall-bladder was attached to the liver, and at this point gangrene had occurred, with resultant small localized abscess in the liver.

This case would appear to emphasize the possibility of long-continued gall-bladder infection becoming complicated by gall-stones, with resultant interference of free emptying of the gall-bladder, diminution in gall-bladder resistance, and an acute lighting up of infection in the gall-bladder wall, with rapid tissue destruction, gall-bladder distention, and threatened rupture. The inflammatory exudate from the gall-bladder wall and the presence of rapidly progressing virulent infection quickly accumulated, with concomitant systemic manifestations of infection. Emphasis should be placed upon the few severe symptoms arising at the time when the most marked pathologic changes were occurring in the gall-bladder.

Case 3. A Young Adult Female in Whom Tonsillitis and Abscesses About Carious Teeth were Rapidly Followed by Dyspeptic and Mild Gall-bladder Distress. Pathologically, Marked Catarrhal Cholecystitis with Cholelithiasis.

This young, unmarried girl, aged twenty-one, was in perfect health until three months ago. At that time she consulted a physician on account of an acute tonsillitis. A month since, the acute affection having subsided, the tonsils were removed. At the time of tonsillectomy several decayed teeth were observed, and radiograms showed abscesses about one lower molar, one upper canine, and two upper incisors. Three weeks since the patient began to experience pain in the left ear, the throat, and the right epigastrium. The neck and throat pains were neuralgic or rheumatoid in character, while the abdominal distress was a dull, aching sensation, with occasional sharp, colicky twinges. The distress was most marked immediately after eating and at night after getting to bed. There were nausea (almost constant), but never vomiting, anorexia, belching of gas, and occasional regurgitation of food. The bowels were constipated.

At the time of entering the hospital the physical examination showed nothing abnormal except mild secondary anemia, enlarged cervical lymph-nodes, moderate gaseous distention of cecum and ascending colon, and pain on deep pressure in the region of the gall-bladder. This tender area was dull to percussion, but on Roentgen examination revealed no atypic shadows. The urine contained no bile-coloring, the feces were normal in consistency, and gave positive test for hydrobilirubin by the Schmidt bichlorid technic. The patient's persistent nausea, anorexia, epigastric distress, and general weakness, taken in association with the history of the development of the digestive upset, determined treatment by laparotomy.

At *laparotomy* a gall-bladder very edematous, thickened, and adherent was demonstrated. On opening the gall-bladder one large cholesterin stone (2 cm. in diameter), numerous small yellow cholesterin stones, varying in size from a millet-seed to a split-pea, were present. The mucosa of the gall-bladder was congested, granular in appearance, and the lymph-nodes along the common duct were greatly enlarged. The gall-bladder was removed, and at the same time several of the decayed teeth were extracted. Cultures from the teeth, the gall-bladder wall, and the small cholesterin stones revealed streptococci apparently of similar type.

By the above case it would appear that we have an instance of rapidly developing gall-bladder-wall infection, secondary changes in the gall-bladder contents, with alteration in the bile and the early formation of gall-stones. From the history of absence of abdominal complaint and dyspeptic upset previous to the acute tonsillitis it would seem that the throat infection maintained a significant etiologic relationship toward the gall-bladder disease. The presence of abscesses about teeth roots and the finding of a culturally similar streptococci in the exudate about the teeth, in the gall-bladder wall, and in the small gall-stones would apparently substantiate this view of the cause of the gall-bladder disturbance.

Case 4. An Adult Male with a Two-year History of Intermittent "Stomach Trouble" of Ulcer Type, Terminating with Duodenal Stenosis. Pathologically, Cholecystitis, Adhesions to Duodenum, Protected Perforation of Large Gall-stone into Duodenum, Duodenal Ulcer.

This patient, a farmer aged thirty-eight, claims to have been in perfect health and free from any contagious or infectious ailment until two years since. At that time he experienced a dyspeptic disturbance. It was intermittent in character, the periods of discomfort occurring every three weeks to two months. At the time of the dyspeptic upset there was epigastric distress, sometimes gnawing or burning, never severe enough to be called actual pain or colicky. The distress appeared from one to three hours following food intake and was promptly and constantly relieved by the ingestion of food. The disturbance appeared more pronounced in the spring of the year. During the past four months the distress has been more or less constant. About six weeks ago there was sharp, sudden pain in the "pit" of the stomach, the pain required morphin for relief, and radiated straight through to the back. Following this sudden, severe pain there was diarrhea for four days, and within two weeks a constant dyspepsia arose, characterized by vomiting four to six hours after eating or at night (the vomitus frequently being of the retention type), nausea, sour eructations, belching of gas, anorexia, constipation, and persistent but gradual weight loss.

Physical examination at the time of entry showed a well-developed male in fair condition of nourishment, there was no anomaly of pulse, temperature, or respiration, the sclera were not jaundiced, there were several infected teeth roots, and moderately large infected tonsils. The abdominal examination was negative with the exception of spasticity of the right rectus muscle and slight tenderness on deep palpation in the right upper abdominal quadrant.

The hemoblogin was 75 per cent., white count 9000, Wassermann negative.

The test-meal revealed persistent twelve-hour food retention. The free HCl 30, the total acidity 84. Test for blood and bile in the gastric extracts were negative. Microscopically, there was a great excess of actively budding yeasts and many bacilli of the colon group.

The stool contained small amounts of undigested food, especially meat fibers; the benzidin test was persistently positive. Hydrobilirubin was present by the Schmidt test.

The Roentgen examination disclosed partial pyloric and duodenal obstruction, fixation of the duodenum, and secondary dilatation of the stomach. The gastric emptying power was retarded so that the stomach held barium mixture longer than twenty-four hours.

At *laparotomy* a dense mass of adhesions formed a tumor the size of a small grape-fruit, binding tightly together the gall-bladder, the liver, the pyloric end of the stomach, duodenum, and the pancreas. The gall-bladder was thickened, very vascular, and at the point where it was most closely adherent to the duodenum had perforated into the duodenum, with resultant duodenal ulcer. A large gall-stone was embedded in the adhesion at the edge of the point of fistula between the gall-bladder and duodenum.

The duodenal ulcer extended into the head of the pancreas. The gall-bladder, ulcerated portion of the duodenum, and the pyloric sixth of the stomach were removed by Dr. Nelson Percy and gastrojejunostomy performed. The patient made an uneventful recovery.

In the above case, chronic focal infections about the mouth and throat would seemingly present an etiologic foundation for a slowly developing gall-bladder malfunction. It would seem from the history and laparotomy findings that the advance of disease in the gall-bladder had been extremely gradual and without symptoms until fistula between the gall-bladder and the duodenum occurred. While it is impossible to state that the duodenal ulcer did not become adherent to the gall-bladder and the ulcer perforate into the gall-bladder with secondary liberation of the large gall-stone, it would seem more likely that the chronically inflamed gall-bladder containing the stone became adherent to the duodenum, and that this resulted in disturbance of duodenul function with formation of ulcer either as a consequence of this disturbance or due to the actual perforation of the stone into the duodenum. The case further emphasizes how impossible it is from clinical history alone to determine in a patient presenting even clean-cut ulcer symptomatology that the ulcer judged to be present from clinical course represents all of the pathology that may be revealed at laparotomy. This case also furnishes a significant hint regarding the limitation of so-called medical ulcer cure with respect to the halting of pathologic changes occurring in the duodenum or in neighboring structures.

Case 5. A Six Weeks' History of Dyspepsia Associated with Pyloric Obstruction, Weight Loss, Cachexia, and Right Upper Quadrant Tumor. Pathologically, Carcinoma of the Gall-bladder, Cholelithiasis, Secondary Involvement of Stomach and Colon.

This woman, aged fifty-six, married, and having given birth to ten children, was entirely well until eight years since, at which time she had a laparotomy for an acute appendicitis. There was good recovery.

Six weeks ago, without any apparent cause, the patient vomited partly digested food a half-hour after eating. Since that time has had constant nausea, the smell of cooking particularly aggravating the nausea; she has vomited daily, usually after the evening meal, and the vomitus has been of the retention type.

There have been upper epigastric distress without definite pain, a feeling of pressure beneath the liver and the heart, constipation, weakness, and a loss in weight of about 20 pounds during the past two or three months.

At the time of entry the patient appeared moderately well-nourished but rather pale, there was a small fetal adenoma of the thyroid isthmus, a well-compensated mitral regurgitation, and, upon abdominal examination, a firm, well-defined, hard, not tender, deeply fixed mass was demonstrated in the right upper quadrant. The edge of the liver was palpable and irregular.

The test-meal showed twelve-hour retention, an excess of mucus, free hydrochloric acid absent, total acidity of 32, positive benzidin test, and, microscopically, food remnants, yeasts, and a few long bacilli of the Boas-Oppler group.

The stool contained hydrobilirubin by the Schmidt test and definite amounts of altered blood by benzidin test.

The *x*-ray examination disclosed pyloric obstruction and a filling defect due to tumor involving part of the antrum, the pylorus, and obliterating the duodenum. There were fixation of the pylorus and secondary dilatation of the stomach. Exploratory laparotomy appeared the only course of procedure.

At *laparotomy* a huge, cancerous mass, apparently arising from the gall-bladder, secondarily invaded the duodenum, the pylorus, the head of the pancreas, and the liver. In the cancerous gall-bladder were found several cholesterin and calcium stones. Anterior gastro-enterostomy was performed with pylorectomy and cholecystectomy.

The above case emphasizes the possibility of long-continued gall-bladder disease associated with gall-stones, and later a development of extensive malignancy. The entire pathologic gamut, from acute simple inflammation to exuberant malignant hyperplasia, progressed with no noticeable symptoms until the tumor mass invaded digestion viscera. The secondary invasion of hollow viscera rapidly resulted in obstruction to the onward progress of food. This mechanical anomaly led the patient to seek medical advice and offered opportunity for a study of the cause of the digestive upset.

Case 6. A Patient Appearing with Rapidly Enlarging Lower Abdominal Tumor. Pathologically, Ovarian Cyst and Large, Thick-walled Gall-bladder Containing Many Stones.

This woman, aged fifty years, with a previous negative history, seeks relief for a rapidly developing abdominal tumor associated with weight loss, nausea, constipation, and dysuria. The tumor became noticeable to the patient about two months since, and has increased in size very rapidly during the past three weeks. There have been no symptoms other than those above enumerated.

Upon entry the physical examination revealed a somewhat cachectic female whose abdomen presented a globular swelling in the lower epigastrium extending above the navel. The swelling was the size of a distended football, and upon palpation seemed movable, elastic, and filled with fluid. On bimanual vaginal examination, the tumor appeared to be connected with the right ovary and manifested characteristics of ovarian cyst.

At *laparotomy* a large ovarian cyst of the simple type was demonstrated, and during the general abdominal exploration a large, thick, adherent, distended gall-bladder filled with many impacted stones was demonstrated. The gall-bladder and the cystic tumor were removed.

The above patient illustrates very forcibly the facts that slowly progressing, long-continued gall-bladder inflammatory changes, associated with stone production, may be present apparently for a long time without giving rise to such clinical symptoms as are commonly associated with gall-stones and with gall-bladder disease. Only the accidental development of another type of abdominal complaint leads to laparotomy, at which time the marked gall-bladder changes are discovered.

The wide variation in symptomatology, etiology, and pathologic changes occurring in gall-bladder disease is abundantly emphasized by the cases here presented. It would appear opportune at this time to review the series of patients affected with gall-bladder disease that I have recently classified.

PART II

CLINICAL CONSIDERATION OF GALL-BLADDER DISEASE BASED UPON AN ANALYSIS OF 1000 PATHOLOGICALLY DEMONSTRATED INSTANCES OF THE AFFECTION.

My report attempts to set forth certain useful facts that have become evident from an analysis of 1000 consecutive, operatively demonstrated instances of gall-bladder disease. The records and pathologic reports are those of hospital patients. They have been accumulated during the past five and a half years.

General Consideration.—1. *Sex.*—There were 672 female and 328 male patients—*i. e.*, rather more than twice as many females as males (ratio, 2.05 : 1).

2. *Age.*—The average age for the series was 43.2 years. The

average age was for females 41.9 years, and for males 44.5 years. It would thus appear that gall-bladder disease is evidenced rather later in life in males than in females.

The minimum age was in females thirteen years and in males fifteen years. In both these instances cholecystitis was complicated by cholelithiasis.

The maximum age was seventy-six years for each sex. In the female patient there was a thick, gray, fibrous gall-bladder, containing 26 large, brown, facetted stones, one of which lay in the cystic duct; in the male there was found a very tense, enlarged, and adherent gall-bladder, stone free.

TABLE I

Sex and Gall-bladder Disease

Females	672 cases.
Males	328 "

(*Ratio*—Females to Males as 2.05 : 1.)

Age in Relation to Gall-Bladder Disease

Females

Age.		No.	Per cent.	
Under 20 years		12	1.8	30 to 60 years, 70.4 per cent.
20 to 30	"	118	17.6	
30 to 40	"	169	25.2	
40 to 50	"	183	27.2	
50 to 60	"	121	18.0	
60 to 70	"	60	8.9	
Over 70	"	9	1.3	

Minimum age	13 years.
Maximum age	76 "

Males

Age.		No.	Per cent.	
Under 20 years		2	0.6	30 to 60 years, 74.7 per cent.
20 to 30	"	41	12.5	
30 to 40	"	75	22.9	
40 to 50	"	85	25.9	
50 to 60	"	85	25.9	
60 to 70	"	34	10.3	
Over 70	"	6	1.8	

Minimum age	15 years.
Maximum age	76 "

Average female age	41.85 years.
Average male age	44.52 "

Table I emphasizes that in females rather more than 70 per cent. of instances of gall-bladder disease occurred between thirty to sixty years; while in males nearly 75 per cent. of cases fell in a like period. Practically the same number of cases were demonstrated in each sex between twenty to sixty years (88 per cent.).

3. *Hereditary Disease.*—From 90 patients (9 per cent.) there was obtained reliable information respecting the appearance of malignant disease in blood relatives. It is interesting to note that there was an hereditary history of cancer in but one of the neoplastic gall-bladders of the series.

A family history of gall-stones was obtained from 10 patients (1 per cent.).

4. *Operative Procedures Previous to Coming Under Observation.*—From 84 patients (8.4 per cent.) the appendices had been removed; in 23 cases (2.3 per cent.) cholecystostomy had been performed, while 7 patients had been cholecystectomized (0.7 per cent.). Upon 48 patients (4. 8 per cent.) pelvic operations had been done either for the correction of real malformations or to relieve "reflex" dyspepsias. Five patients had been gastro-enterostomized in the attempt to cure existing or suspected peptic ulcers. In none of these cases had the gall tract been surgically treated.

5. *Previous Infectious Diseases.*—Only information of relative accuracy can be presented. In numerous histories all illnesses occurring from birth to young adult life are summed up by the vague term "children's diseases." Such a phrase never should be permitted in any history unless definitely qualified. Recent bacteriologic and pathologic advances have taught that many ailments common to the early years of life are responsible for serious local or systemic damage in later years. This is particularly true of the acute exanthemata and of inflammations of lymphoid tissue.

TABLE II

SHOWING THE RELATIONSHIP OF BACTEREMIAS, SEPTICEMIAS, OR CHRONIC LYMPHATIC INFECTIONS TO GALL-BLADDER DISEASE

Disease.	Cases.	Per cent.
Typhoid fever	206	20.6
Measles	180	18.0
Chronic tonsillitis	146	14.6
Scarlet fever	145	14.5
Pneumonia	115	11.5
Infected teeth	93	9.3
Chronic rheumatism	92	9.2
Malaria	87	8.7
Whooping-cough	75	7.5
La grippe	66	6.6
Mumps	62	6.2
Diphtheria	47	4.7
Chicken-pox	47	4.7
Chronic "sore throat"	46	4.6
Chronic bronchitis	20	2.0

Table II presents significant information with respect to infectious ailments and gall-bladder disease. It is apparent that while typhoid fever is the most common febrile or infectious disorder associated with gall-bladder affections, yet, well toward the top of the list, are many so-called "children's diseases." Particularly prominent are those ailments which present characteristics of bacteremias or of low grade, persistent, or recurrent infections of lymphatic tissue. In many of these ailments streptococci, diphtheroid bacilli, and micrococci are fairly constant findings. Their importance with relation to concomitant or future gall-bladder disease is emphasized, when it is recalled that the experimental investigations of Rosenow have seemingly demonstrated a peculiar affinity of organisms of the coccus group for the walls of the alimentary tract, particularly that of the gall-bladder. These bacteria are quite commonly found in the gall-bladder mucosa, in bile, and in the interior of gall-stones; in fact, they would appear to occur more frequently than do organisms of any other type, not excluding *Bacillus typhosus* or *B. coli*. It is, therefore, evident, how important, etiologically, the history of such ailments as measles, scarlet fever, tonsillitis, "rheumatism," whooping-cough, la grippe, mumps, diphtheria, etc., may become with respect to digestive anomalies, whether the upset occurs at the time of the acute, infectious ailment or at some future date. The demonstration, at physical examination, of infected gums, head sinuses, maxillæ, joints, tonsils, and superficial lymph-gland chains further emphasizes a probable causative agent in the production of alimentary tract disturbances. There were 112 patients (11.2 per cent.) in the series in whom acute infectious ailments seemed to be directly responsible for the initial evidences of gall-bladder disease or for exciting to activity processes previously quiescent.

In some way *pregnancy* or *childbirth* appear to affect gall-bladder function. A definite relationship was manifested by 65 of our cases (6.5 per cent.). In such a physiologic state a demand for increased activity from the liver, gall-bladder, and the alimentary tract may be sufficient to disturb even the *normal* biliary mechanism. If demand for excessive function be made *upon a gall tract already the seat of disease* (as a low-grade infection) it would appear reasonable to expect bacterial proliferation and inflammatory change, permissible as a consequence of lessened local tissue defense.

Laparotomy Findings.—1. Of the series of 1000 cases, non-malignant cholecystitis associated with calculi was demonstrated in 509 patients (50.9 per cent.). In 46 patients (4.6 per cent.) the inflamed gall-bladder contained altered bile mixed with sand-like substance. Twenty-three (2.3 per cent.) were affected with malignant disease of the gall-bladder, and in 16 patients of this group (69+ per cent.) gall-stones were present. In the remaining 7 cases it was not possible to prove the previous presence of stones, although in 4 cases the early histories suggested them.

There were 430 cases of cholecystitis (43 per cent.), in which neither gall-stones, "sand," nor malignancy were demonstrable. These gall-bladders all exhibited definite evidences of disease, and, as will be pointed out later, the clinical manifestations had been by no means mild nor transient.

Mortality.—Including all types of ailment, there was an *operative mortality* of 5.9 per cent.

2. *Associated Lesions.*—The concomitant incidence of ap-

pendix and gall-bladder disease has been frequently commented upon. MacCarty[1] found definite gross and microscopic appendix lesions in 69 per cent. of 59 patients operated upon for gall-bladder affections. In my series 84 patients (8.4 per cent.) had had their appendices removed before coming under observation for the gall-bladder ailment. At the laparotomy for the latter in 682 cases (68.2 per cent.) there was sufficient pathology to warrant appendicectomy. Combining the two observations, it would seem that of 1000 instances of gall-bladder disease in 766 patients, or rather more than 3 out of 4, the appendix was also abnormal. In many patients the histories indicated appendiceal disturbances before gall-bladder function was so sufficiently impaired as to give rise to definite symptoms.

TABLE III

SUMMARY OF FINDINGS AT LAPAROTOMY

Cholecystitis with stones in	509	cases, or	50.9	per cent.
Cholecystitis with "sandy" bile in	46	" "	4.6	" "
Carcinoma { with stones in 16 without stones in 7 }	23	" "	2.3	" "
Cholecystitis without stones in	430	" "	43.0	" "

ASSOCIATED LESIONS		Cases.	Per cent.
Appendix disease		682	68.2
Gastric ulcer		43	4.3
Duodenal ulcer		37	3.7
Gastric cancer		14	1.4
Pancreatitis { Acute 2 Chronic 63 }		65	6.5
Enlarged lymph-glands	Non-malignant	124	12.4
	Malignant	11	1.1
	Total	135	13.5
Liver enlarged		73	7.3

Table III details valuable information with regard to other lesions associated with gall-bladder pathology. Evidences of the actively progressive infective nature of gall-bladder disease are abundantly demonstrated by the observation of enlarged lymphatic glands in 124 cases (12.4 per cent.), chronic pancreatitis with enlargement in 63 cases (6.3 per cent.), acute pancreatitis with hemorrhage and fat necrosis in 2 cases, and enlarged liver in 73 cases (7.3 per cent.). The presence of peptic ulcer (gastric and duodenal) in 80 patients (8.0 per cent.) may be more than a pathologic coincidence. It certainly indicates limitations in the diagnosis and prognosis of both ailments.

Pathologic Changes in the Gall-Bladder.—A working knowledge of the nature and character of the pathologic changes occurring in the gall-bladder would appear to be essential for a proper appreciation of the clinical manifestations for which these pathologic alterations may be responsible. It is an unfortunate fact that to both the lay and the professional mind gall-bladder pathology means largely late stage affections, as gall-stones, obstruction, perforation, thickening, or fibrous adhesions. The average text-book considers cholecystitis in a vague, uncertain way, as though it were *not an ailment second in frequency of all intra-abdominal disease only to lesions of the appendix*. Commonly cholelithiasis meets recognition as an acute dramatic, abdominal crisis, in which the chief rôles are played by colic, chill, fever, sweat, and jaundice.

The basis of gall-bladder pathology is largely the reaction of four layers of tissue to infection. The infection is most commonly blood-borne. It is quite likely that bacteria first produce changes in the mucosa and submucosa. Such changes consist in congestion and infiltration of the villi with lymphocytes (*catarrhal cholecystitis*). *In situ* the gall-bladder, grossly, to sight or touch presents no marked variation from the normal. The palpating hand of the surgeon detects no abnormality. Unless there has occurred excessive mucus excretion and the bile is so thickened that it is forced through the gall-ducts with difficulty, such gall-bladders are commonly pronounced "normal," and remain untouched. Yet this type of gall-bladder is seemingly the foundation type for the majority of gall-bladder ailments. It is also the actively infected type. Indeed, it most frequently furnishes the purulent, necrotic, gangrenous, and perforative complications. The whole gall-bladder need not be involved. The fundus is quite commonly affected early and remains infected longest. The contents of the gall-bladder are usually thick bile, mixed with mucus. Stones or "sand" may form within a few weeks. They have as their nuclei agglutinated bacteria, precipitated mucus, or cellular *débris*. There is usually an excessive secretion of cholesterin.

In our series there were 228 cases (23.2 per cent.) of acute or subacute catarrhal cholecystitis. Stones complicated in 51 per cent., "sand" in 8 per cent. Many of these gall-bladders would undoubtedly have remained untouched had not the history of frequent infections and of dyspeptic upsets, the appearance of the bile obtained upon gall-bladder puncture, the presence of stones or "sand," the vascularity of the gall-bladder wall, or the finding of enlarged lymph-nodes along the bile ducts directed special attention to the gall-bladder. Tissue cultures show that from such type of gall-bladder positive growths are most commonly obtained. Bile, mucus, and stone cultures also yield the highest percentage of positive growths. The organisms most commonly found are non-hemolytic streptococci, colon bacilli, staphylococci, and fusiform bacilli. *Tissue culture of the gall-bladder wall may be positive*, and yet the contents of the gall-bladder practically negative. There may be several organisms cultured from both wall and bile. The *enlarged lymph-glands* along the bile-ducts may return organisms similar to those of the gall-bladder wall and of the bile. The streptococcus appears to have a peculiar affinity for the lymphatic chain draining the gall-bladder.

If no acute crisis supervenes or if there is no operative interference, "acute catarrhal cholecystitis" may progress to the chronic form—viz., *strawberry gall-bladder*. Here the mucosa is most greatly affected. It is congested, strawberry red, and velvety. The apices of the villi become eroded and lose their epithelium. Consequently, yellow specks dot the reddened mucosa. They represent minute bits of scar tissue where the epithelium has been destroyed. These yellow specks are frequently wrongly considered to be fine stones of "sand."

The gall-bladder wall may still exhibit little gross change. There is commonly, however, some edema and thickening. The thickening may, in some instances, be pronounced. The contents of the gall-bladder may be merely thickened bile or mucus.

In our series chronic catarrhal cholecystitis or "strawberry gall-bladder" was present in 328 cases (33.6 per cent.). Stones or "sand" complicated in 62 per cent.

Should spontaneous regression of the gall-bladder inflammation proceed, or the gall-bladder be left undisturbed, infection may rapidly or gradually (intermittently or fairly constantly) involve the deeper layers of the wall. Edema, lymphocytic infiltration, and increased vascularization may occur. Purulent, necrotic, or gangrenous changes may appear rapidly, either during the progress of an acute infection, or at the lighting up of a local focus, in a chronically infected bladder wall. The peritoneal layer quickly may be involved and adhesions to neighboring viscera take place. Retrograde changes may likewise occur locally or generally. In a surprisingly short time dense scar tissue or even calcareous areas may be seen.

Our series exhibited 425 cases (43.4 per cent.) of chronic cholecystitis. Stones or "sand" were associated in 91 per cent.

Primary malignant diseases of the gall-bladder may be local or general.

When the affection is *local* the origin is apparently due to faulty cellular proliferation of the epithelium covering the hyperplastic villi. The stimulating agent is unknown, but the relation between chronic, low-grade bacterial activity and gall-stone formation toward malignant disease of the gall-bladder would seem to be quite strong.

In *general neoplastic* change the gall-bladder always presents evidence pointing to long-continued inflammation, *histologically* speaking. The time duration may be quite short—certainly as short as within a few months. Gall-stones may be formed during the preliminary steps leading up to the appearance of the malignant disease. The fact that calculi are often found in malignant gall-bladders does not of necessity prove that such calculi caused the cancer; they may have been formed as the cancerous change altered the excretory function of the gall-bladder or prevented its proper motor activity. It is only when there has been a long history of intermittent attacks of a *benign*, abdominal distress, whose origin can be definitely traced to the gall tract, and when *this distress* later takes on the character of a *malignant* disease, that we can surmise that the "irritation," so called, from long-existing gall-stones has contributed to the onset of cancer. If in the course of the benign ailment gall-stone "colics" and signs of biliary tract obstruction are exhibited, the case against calculi as instigators of malignant disease is more strongly established.

There were 23 cases of cancer of the gall-bladder in my series. Gall-stones were coincident in 16 cases (69± per cent.). The average duration of symptoms of 17 of the cases was rather more than six months. The remaining patients had been ill from two to thirty-six years. In a case exhibiting symptoms intermittently for ten years but one medium-sized stone was present.

1. *Contents of the Gall-bladder.—Fluid.*—This may vary greatly, from a few cubic centimeters of golden bile to enormous quantities of greatly altered bile. That the gall-bladder has great capacity for distention is shown by one of our cases, in which nearly *4 gallons* of black bile were drained from the bladder of a female, aged twenty-two, who had been ill but two weeks. An acute catarrhal cholecystitis with cystic duct obstruction had followed la grippe. It is characteristic of cystic duct obstruction to produce the greatest gall-bladder distention. Where obstruction occurs in the common duct that duct may be greatly distended, but commonly the gall-bladder is small. Stone or catarrhal obstruction of the hepatic duct may likewise result in small gall-bladder.

The *physical characteristics* of the gall-bladder contents are likewise influenced by the nature of the inflammatory process going on in the mucosa. Persistent inflammation produces desquamation, and later atrophy of the mucosa. Excessive amounts of mucus, bacteria, epithelial elements, and cholesterin are thrown off. The normal golden bile becomes turbid, thick, mucoid, and often dark. It may be almost black. Pus and blood admixtures occurred in 11 per cent. of our cases. If drainage remains fairly free, the altered bile may in part pass. The thickened portion may remain behind as a dark, inspissated, formless paste.

Stones may occur at *any stage of an infected process.* They may require but a few weeks for their development. There were 21 cases in our series where gall-bladders had been drained and then the patients reoperated within six months, and where at the second operation even large stones were found in the gall-bladder remnant. *It is important that the idea should be dissipated that gall-stones mean years of gall-bladder disease.* There is abundant evidences, experimentally and clinically, demonstrating that but weeks to a few months are sufficient for their formation. The determining factors are mainly continuance of low-grade inflammatory changes in the gall-bladder wall and defective gall-bladder emptying. A young girl in my series had a thorough drainage operation for acute cholecystitis associated with typhoid fever four weeks previously. Nearly 100 medium-sized cholesterin stones were demonstrated. A second operation was necessary within three months: the bladder was again full of stones, some of which were tightly embedded in honeycomb-like fibrous spaces in the gall-bladder wall.

We have already mentioned that the nuclei of stones are commonly agglutinated, though usually viable bacteria. These may be embedded in mucus, small blood-clots, or cellular débris. Viable bacteria may readily be cultured from crushed gall-stones where the bile is sterile. Indeed, it is seemingly true that 85 per cent. of gall-stones contain viable bacteria, whereas bile is actively infected in but about 20 to 30 per cent. of instances.

The gall-stones may *vary greatly in size*—from pinhead to as large as a chicken's egg. The conglomerate or "mulberry" stones are apt to be very large.

The *number of calculi* may be astonishingly great. In the instance of a female aged fifty, who had had "bilious attacks" all her life, there were, by actual count, 2631 stones. Larger numbers have been reported: Ochsner, 6789; W. Mayo, "between five and six thousand," and Schachner, 14,000.

Clinical Symptomatology.—1. *General.*—There were 59 cases of gall-stones in which there were no disturbances that pointed to gall-bladder upset. It is difficult to say that in these cases there had been no departure from normal health. In fact, close analysis, *after the patient had been proved to have gall-stones*, usually disclosed mild digestive upsets that had been classed as "dietetic," or in the presence of ailments of severe nature, had been disregarded. It is also surprising how many of the "symptomless" gall-stone patients give history of acute infectious ailments, jaundice years previously, or, upon close questioning, recall forgotten attacks of painful type that have been passed by as "acute indigestion," "gastralgia," "ptomain poisoning," and the like.

(*a*) *Type of Individual.*—The opinion appears to be quite general that patients affected with gall-bladder ailments are overnourished or even obese. The diagnostic dictum, particularly with regards females, of "fair, fat, forty, belches gas, hence gallstones," has obtained a greater vogue than its alliterative or its pathologic accuracy warrant. Less than 8 per cent. of our patients were obese or had consistently gained weight. There was weight loss in 493 cases (49.3 per cent.). It ranged from 5 to 73 pounds. The greatest, most persistent weight losses were in the cancer cases. Stone and simple cholecystitis cases either maintained weight or lost it intermittently.

There were 507 cases in which there had been neither weight loss nor gain.

(*b*) *Belching* was prominent and distressing in 68.9 per cent. It was commonly associated with pyrosis or water-brash. *Nausea* was annoying in 376 cases (57.6 per cent.).

(*c*) Appetite was styled "good" in 363 cases (36.3 per cent.), fair in 353 cases (35.3 per cent.), and poor in 273 cases (27.3 per cent.).

(*d*) *Bowels.*—There was no anomaly in 282 patients (28.2 per cent.). Constipation of an obstinate type was complained of by 612 cases (61.2 per cent.). There was persistent diarrhea in 51 cases (5.1 per cent.). Diarrhea alternated with constipation in 44 cases (4.4 per cent.). It was noted that in the diarrhea cases, at laparotomy, there were generally observed swollen, enlarged pancreas and lymph-nodes. Persistent diarrhea was the presenting symptom in 8 of the malignant patients.

2. *Type of Ailment.*—In 92 per cent. of cases the gall-bladder disease meant, to the patient, a *dyspepsia*, often of not serious nor

inconveniencing nature, but punctuated by crises of such severity as to be prostrating or decidedly inconvenient. In the remaining 8 per cent. of patients the crises came without premonition or the ailment was so-called "symptomless."

There were 236 (23.6 per cent.) patients who had persistent dyspepsias; 489 cases (48.9 per cent.) where there was frank intermittency, but the attacks fairly frequent, and 207 cases (20.7 per cent.) where the disturbance was only manifested at widely separated intervals.

3. *Relation of Type of Symptoms to Pathologic Changes.*—Except in the cancer patients, it is not possible before laparotomy to group cases with respect either to their being simple, uncomplicated, cholecystitis, or the same associated with gall-stones. This may seem a striking and somewhat radical statement, but it is amply borne out by observations made at operation. While it is true that so-called biliary colics are rather more common in the stone cases than where stones are not present, yet in our series the percentage difference was only 7 per cent. Similar observations apply with regard to the presence or absence of evidences of obstructed bile flow. Jaundice was present in 161 cases (31.6 per cent.) where gall-stones were demonstrated. Jaundice was intermittently or constantly present in more than 25 per cent. of the patients in whom operated interference demonstrated no gall-stones. Of course, it was not possible to state that in the latter group of cases small stones had not previously been present and had passed before surgical interference. The point we wish to make is that it is extremely difficult even when the history of the case has been well developed, where thorough physical and laboratory examinations have been made, and where the intelligence of the patient is above the average, to correctly prognose before laparotomy what will be the finding when the gall-bladder is actually visible and palpable. One can usually only make the diagnosis of cholecystitis, and if jaundice is persistent, attacks of severe pain have constantly been associated with jaundice, such attacks have been frequent and the disease has existed for longer than six months, it is safe to hazard the prognostic statement that, in addition to the inflamed gall-blad-

der, stones may coexist. Persistent jaundice usually means duct obstruction, generally the cystic or the common bile-duct. There were but 41 cases in our series in which there was persistent obstruction of the hepatic duct.

Pain.—This was a characteristic symptom in 95.5 per cent. It was intermittently manifested in 688 cases (71.3 per cent.). There was constant discomfort or actual pain in 211 cases (22.4 per cent.).

TABLE IV

PAIN IN GALL-BLADDER DISEASE

	Cases.	Per cent.
Intermittently present in	688	73.1
Constantly present in	211	22.4
Constant—later intermittent—in	26	2.7
Intermittent—later constant—in	18	1.9
No symptoms in	59	5.9

INCIDENCE OF "COLICS" IN GALL-BLADDER DISEASE

	Cases.	Per cent
"Colics" exhibited in	534	53.4
"Colics" absent in	466	46.6

STONE CASES (525)

(Including Malignancy)

	Cases.	Per cent.
"Colics" exhibited in	323	61.5+
"Colics" absent in	202	38.4

SAND CASES (46)

	Cases.	Per cent.
"Colics" exhibited in	20	43.5
"Colics" absent in	26	56.5

NON-STONE CASES (430)

	Cases.	Per cent.
"Colics" exhibited in	235	54.6
"Colics" absent in	195	45.3+

In the non-gall-stone cases it is extremely difficult to state that just so severe pain were not manifest as in the cases where stones were present. In the non-stone cases the attacks of severe pain were apparently due to small stones that had passed before laparotomy, interference with free passage of bile down the ducts as a consequence of accumulations of bacteria, cell detritus and tough mucus, or a local twisting of the gall-bladder, anomaly of the neck of the bladder or a twisting, kinking, or adhesive stricture of the cystic duct. Such pain may be severe enough to be classed as "colic." The muscular contraction of the distended gall-bladder, the walls of which are actually the seat of active infection, that infection frequently being productive of a fibromyositis, is not an inconsiderable factor in producing annoying distress. In a few instances large lymph-nodes pressing upon the common or the cystic duct have been sufficient to account for severe paroxysmal pain.

In the stone cases, however, one of the chief distinguishing characteristics of the severe pain lies in the observation that the pain commonly ceases almost as abruptly as it develops. There is frequently a subjective sensation on the part of the patient of the pain traveling, and instances are frequent enough where the affected individual will quite accurately outline the course of the common duct as the stone is progressing down the same. There is often a sudden cessation of pain and a rapid clearing up of jaundice as small stones pass through the papilla of Vater into the duodenum. The most annoying pains are those associated with impaction of small stones in the ampulla-like neck of the gall-bladder. An accumulation of stones at this point may obstruct the cystic duct and thereby cause clinical evidences of gall-bladder distention, but the duct may, in the main, remain stone free. Such cases are complicated by jaundice when there are stones also in the common or hepatic ducts. Cystic duct stones or stones in the ampulla were present in 41.6 per cent. of our stone cases. Jaundice was associated with cystic duct stone in 11½ per cent. of cases. Such jaundice was due either to projection of the stone from the cystic into the common duct, to secondary catarrhal inflammation in the common duct, or to small stones that had passed into the hepatic or the common duct.

Relief of Pain.—The severe colics require *opiates*. There seems to be nothing else that so quickly or so satisfactorily relieves the agonizing discomfort. More than 72 per cent. of our stone cases and more than 59 per cent. of the non-stone cases have required hypodermic administration of morphin during the acute attacks of distress. In individuals who are chronically sick the danger of an opiate habit becoming established as a consequence of free hypodermic injections must never be forgotten.

In 90 per cent. of our cases the pain was relieved by *heat* applied externally or administered internally in the shape of hot drinks or gastric lavage. There was *vomit relief* in rather more than 45 per cent. of cases. Many more cases than these vomited, but the emesis was not always accompanied by relief of symptoms. In 82 per cent. there was relief of abdominal distress by *belching*. In 9 per cent. relief from pain was only obtained by *alterations in posture*. Less than 7 per cent. of our cases obtained relief of distress by the *ingestion of food*. In young individuals, where there exists a "hyperacidity syndrome," this absence of relief of pain upon food ingestion furnishes an important point in the differential diagnosis between peptic ulcer and gall-bladder disease. How important this is becomes evident when it is recalled that in uncomplicated peptic ulcer food relief of pain is obtained in more than 74 per cent. of patients. In gall-bladder disease relief of distress by the taking of *alkali* is constant in about 22 per cent. of cases. Patients state that the alkali either facilitates the belching or it counteracts stomach sourness or the sensation of burning.

Characteristics of Pain.—(*a*) *Time.*—The main characteristic is that pain appears irregularly in an individual previously apparently well, or it occurs constantly without any apparent definite causative factors. This applies both with respect to pain in cholecystitis and in cholecystitis associated with cholelithiasis. This is in striking contrast to the clean-cut, time relation factors associated with peptic ulcers, where in more than 80 per cent. of uncomplicated cases there is direct relationship between cause and effect—that is, the pain occurs quite regularly from two to six hours following food intake; it has a characteristic form of relief, namely, by food ingestion, alkali, or vomiting. In ulcer but rarely is the pain severe enough to require the administration of opiates—in but 12 per cent. of 553 operatively demonstrated instances of peptic ulcer which I recently analyzed.

(*b*) *Type of Pain.*—The severe colics are usually described as knife-like, sticking, stabbing, piercing, doubling up, or boring pain. The distress is probably more prostrating than is pain in any other form of digestive upset, unless it be that associated with perforation of a gastric or a duodenal ulcer. If the patient is not affected with colics his distress is usually described as a sensation of fulness, up-pressure (32 per cent.), soreness, dull ache, burning, and when the gall-bladder disease is complicated by peptic ulcer (8 per cent. in our series), gnawing.

Location of Pain.—This is usually in the right upper quadrant (74 per cent.). In numerous instances the distress is throughout the entire epigastrium (14 per cent.). Not rarely there is a widely disseminated area of discomfort, but a spot of especial distress at the right costal margin. In 4 per cent. of our cases all the pain lay in the back, either at or beneath the scapulæ or along the spine, from the eighth to the twelfth dorsal vertebræ. Not a few patients had been undergoing osteopathic treatments for the readjustment of so-called dislocated vertebræ. Removal of the gall-bladder apparently caused the vertebral articulations to become normal in an extremely short time. There were 5 cases where all of the pain lay in the right shoulder, and where the patient had been for many years treated for rheumatism and neuritis. In 3 per cent. of cases all the pain was to the left of the midline, either in the abdomen or beneath the left scapula. There were 2 patients in whom disease of the right hip-joint was suspected because more or less constant distress was present in the joint and down the right leg.

Transmission of Pain.—In 32 per cent. of the whole number of cases in the series no transmission was recorded. In 23 per cent. of the stone cases there was no transmissible distress, while in 41 per cent. of the instances of non-calculous cholecystitis there was no radiation of pain. Pain was most commonly transmitted into the right back or infrascapular zone (63 per cent.). In 12 per cent. the radiation was under the right ribs, in 7 per cent. toward the sternum, midepigastrium, the left scapular, or the left rib edge. In 4 per cent. of cases there was definite radiation of pain constantly to the region of the navel.

Abdominal tenderness was recorded in 883 cases. There was no abdominal tender area in 117 cases (11.7 per cent.). There was dorsal tenderness (commonly along the lower thoracic or upper lumbar spines and usually to the right) in 29 (4 per cent.) of 760 cases examined for such. It is often surprising how slightly tender the gall-bladder may be to palpation when compared to the pathologic changes demonstrated at laparotomy.

Epigastric tumor or ridge was present in 89 cases (8.9 per cent.). The liver was definitely palpable in 39 cases (3.9 per cent.). There was a fluctuating tumor in 7 cases (0.7 per cent.). These were instances of greatly distended, perforated, or abscessed gall-bladder.

Signs of Obstructed Bile Flow.—Of the entire series of 1000 cases, *jaundice* was a sign in 287, or 28.7 per cent. It was noted in 161 (31.6 per cent.) cases of cholecystitis associated with stones, and in 101 (25.9 per cent.) of the cases of cholecystitis where stones were present.

TABLE V

SIGNS OF OBSTRUCTED BILE FLOW IN GALL-BLADDER DISEASE

Jaundice		Cases.	Per cent.	
Absent in		741	74.1	
Present	intermittently in	151	15.1	25.9%
	constantly in	35	3.5	
	possibly in	73	7.3	

Stools	Cases.	Per cent.
Bile present and blood absent in	724	72.4
"Clay-colored" stools in	181	18.1
Blood present in	26	2.6

(Hemorrhoids in 115 cases of series—11.5 per cent.)

	Cases.	Per cent.
"No symptoms" in	59	5.9

Urine		Cases.	Per cent.	
Bile absent in		810	81.0	
Bile	present in	128	12.8	19%
	possibly present in	62	6.2	

Gall-stone Cases		Cases.	Per cent.
Jaundice	present in	161	31.6
	absent in	348	68.4

The stools were "clay-colored" in 181 (18.1 per cent.) cases of the series. They contained enough bile-pigment to color them sufficiently to cause no macroscopic change in 724 cases. In 26 instances (2.6 per cent.) the stools were discolored by blood, usually from hemorrhoids. In the 59 instances of gall-bladder disease presenting "no symptoms" there were no stool abnormalities recorded.

Excess of *bile-pigment in the urine* was observed or had been previously recorded in 190 cases (19 per cent.) of the series. In the remaining 810 cases the urine had seemingly been grossly unaltered.

In association with "colics" and evidences of obstructed bile flow, the classic triad of symptoms, "chill, fever, and sweating," were noted respectively but in 44, 54, and 36 instances.

Vomiting proved an annoying symptom in 452 cases (45.2 per cent.). Retention vomiting occurred in nearly 6 per cent. Adhesions about the duodenum or pylorus, enlarged lymph-glands, pressure from distended gall-bladder or liver, or in association with swollen pancreas were the cause of retention vomiting, when such was of constant occurrence. Marked pyloric or gastric spasms not rarely resulted in the intermittent emesis of food that had lain in the stomach longer than twelve hours. In 62 per cent. of all patients vomiting, fresh or oxydized bile was noted in the gastric contents.

Test-meals.—Complete test-meal records were obtained from 407 patients. In 9.2 per cent. there was some degree of twelve-hour retention. Of all the cases the average free HCl was 32.6; the average total acidity 47.9. Gastric achylia was observed in 20.9 per cent. of cases. Of 12 cancer cases where there were test-meal records free HCl was constantly absent in 6. When such was combined with gastric stagnation, lactic acid was demonstrated. In cases of this type the analysis of the gastric contents so strongly resembled those from cancer patients that from this evidence alone no diagnostic differentiation was possible.

Roentgen Evidence of Gall-bladder Disease.—In 87 consecutive instances of cholelithiasis stones were definitely or inferentially demonstrated by plates in 19 cases (21 per cent.). Frequently the laparotomy revealed great numbers of stones where the *x*-ray plate had shown but several, or where upon the plates only vague shadowy outlines of calculi or enlarged, misplaced, or malformed gall-bladders were evident. In a few instances of greatly distended gall-bladder the radiogram revealed an atypically placed upper abdominal shadow that, in view of the history and the physical examination, was judged to be the gall-bladder.

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CLINIC OF DR. CARL BECK

North Chicago Hospital

A NEW METHOD OF GASTROSTOMY

Summary: A patient presenting the absolute indications for gastrostomy; conditions which the ideal gastrostomy must meet; the new technic.

This patient is a gentleman who through a tumor of the larynx and pharynx has lost the possibility of breathing and swallowing through his mouth. Up to a very short time ago he was able to get along with a tracheotomy tube and was still able to swallow liquids. The treatment with *x*-ray and radium has prevented the recurrence of his original growth, but it has created such constriction by scar of the region of the pharynx and larynx that the edematous swelling of the mouth does not allow him to close his mouth or even swallow a drop of water. For the past few days he has not been able to get anything in the way of food. It is, therefore, a case with absolute indication for gastrostomy, particularly since he is free from pain or any other symptoms of tumor.

The older methods of gastrostomy (Witzel, Kader, Senn, Frank, etc.) have been unfavorable in many instances because of leakage or obliteration. If a permanent gastrostomy is to be made it has to fulfil two indications: In the first place it must be made so that it does not leak; second, it must be made so that it does not close spontaneously after the removal of the catheter which is put into those gastrostomies immediately after the operation.

The method which we have used here in this case, as in a number of previous cases, is somewhat similar to the method which Carrel and I originally advocated for the reconstruction of the esophagus from the greater curvature of the stomach, an operation which was later described by Jianu of Bucharest, about ten years ago.

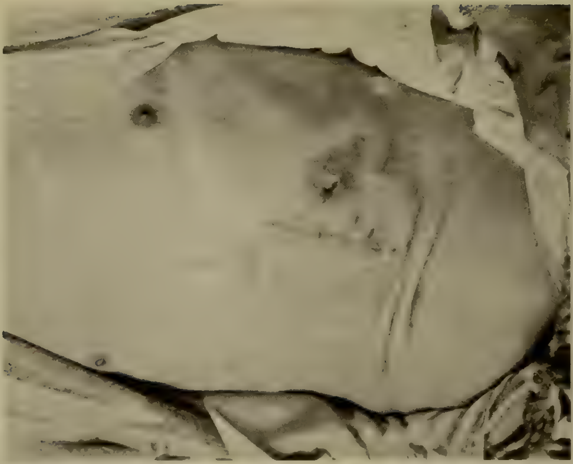


Fig. 169.—Appearance of abdomen after healing has occurred. Note the incision in the median line and, laterally, the opening in the skin above the costal arch. One may see the scar where the flap was taken to form the skin tube.

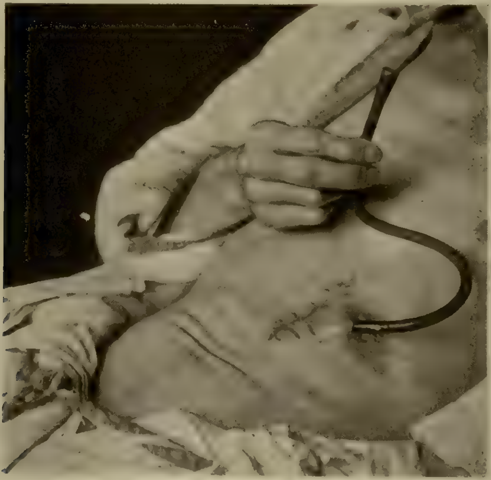


Fig. 170.—A large size catheter in the tube to facilitate the introduction of food into the stomach.

In this particular case the new esophagus is made into the shape of a narrow tube from the skin of the chest leading down into the stomach. The method is as follows: An incision is made in the rectus muscle on the left side of the median line under local anesthesia. The stomach, as high as possible toward the cardia, is brought forward. It is grasped by a Tuffier forceps and held there in the center of the incision. Then another incision is made alongside the border of the ribs, a little higher than this border, so that the opening afterward lies between the ribs forming the costal arch. This incision allows a tunnel to be made from the skin down through the rectus muscle toward the stomach, and through this tunnel is brought forward the stomach in the shape of a small pouch. It is fastened with a circular row of sutures in the long median incision, so that it will not slip entirely back into the abdominal cavity, and a small cone-shaped tube of stomach wall runs through the tunnel toward that lateral opening. Now a flap is made from the skin of the costal

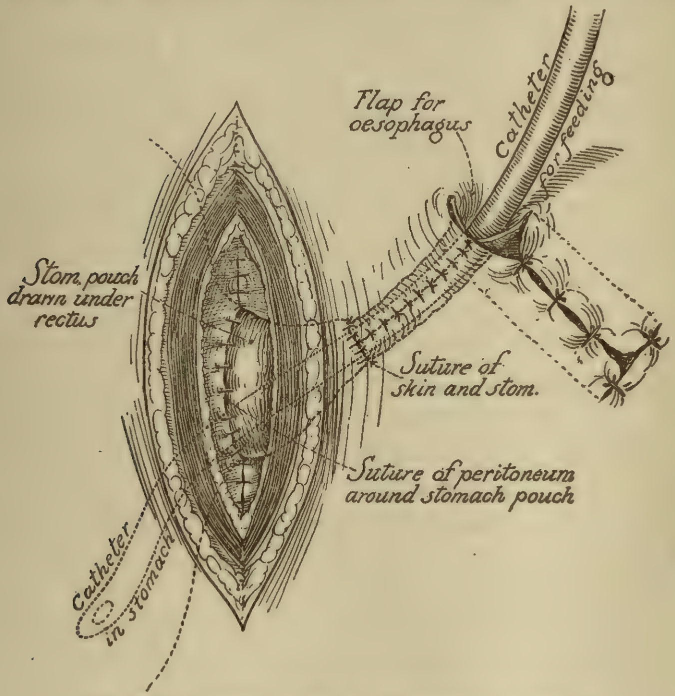


Fig. 171.—Schematic figure of the operative technic.

arch wide enough to form a tube. It is sutured in the shape of a tube around a large size catheter. At this moment the stomach is opened and the opening is made about the size of the caliber of the newly formed tube of skin. The catheter is passed into the stomach and the skin tube and the stomach opening are united by exact sutures. The skin tube with the catheter is now allowed to slip into that tunnel, the stomach being rather prone to slip back, which will bring the junction of skin and stomach into the lower third of the tunnel. The median incision is now closed with exact sutures.

The catheter is left in place for about one week, and used for feeding. After one week there is a channel running from the opening in the costal arch region, lined by skin in its upper two-thirds, by mucous membrane and stomach wall in its last third, which allows the easy and free passage of a catheter if necessary, and which allows the feeding of the patient through the costal arch opening by a syringe (Figs. 169–171). It will not leak, particularly when one uses a small gauze sponge and adhesive strip to press the lips of the new opening closely together. It fulfils all the requirements of the gastrostomy, it does not close spontaneously, it does not form a stricture, and it allows the passage of a catheter and direct feeding. One can make the length of the feeding tube of skin and stomach as long as desirable.

CLINIC OF DR. FREDERIC A. BESLEY

Cook County Hospital

SURGICAL AFFECTIONS OF THE STOMACH AND DUODENUM

Summary: Presentation of 10 cases illustrating the symptoms, diagnosis, and the results of treatment of gastric and duodenal ulcer and carcinoma; difficulty of differentiation between benign and malignant ulcer; recurrence of symptoms after apparent cure; cancer cachexia; pathology of gastric ulcer; etiologic relationship of cancer and ulcer; surgical indications in the presence of gastric ulceration; pyloric exclusion.

This morning we want to take up the surgical affections of the stomach and duodenum, as we have been fortunate enough to secure a large number of cases upon which we have operated with good results. You will recognize that in dealing with this subject we will necessarily encroach upon the ground usually covered by the internist. In other words, many of these cases, involving the pathology of the stomach and duodenum, are the so-called borderline cases.

In considering the surgical pathology of the stomach and duodenum we are not going to take up the conditions that are surgically simple. Stab-wounds and gunshot wounds of the stomach occur rather frequently, but the pathology and operative procedure are surgically simple. It merely means suture of the defect, whatever that defect may be. This narrows our field to the consideration of the surgical aspects of two general conditions, namely, ulcers with their complications and tumors.

CASE I

This man presents a most interesting clinical picture. He is twenty-six years of age and was operated on four months ago. His trouble began with pain in the epigastrium, coming on in paroxysms about two hours before eating, then disappearing with the meal, only to reappear several hours after eating. This continued for about a year and a half, when the patient came to the hospital. He was operated on September 16, 1916, and was fairly well until a few weeks ago, when the pain in the epigastrium returned and has been present almost continuously ever since. He has vomited two or three times in the last week. He says the vomitus is of a yellow color. He states that he had some pain in the abdomen when he was fourteen years of age, but does not know what it was. In other words, his primary symptoms began two years ago, and became progressively and consistently worse until last September, when he was operated upon.

At the time of the operation it was found that he was suffering from a slowly perforating carcinomatous ulcer of the pylorus. That slowly perforating ulcer was fairly well walled off and there was no leak. There were some rather firm adhesions to the liver. The mass at the pylorus was resected and a gastro-enterostomy was done.

The patient gained rapidly in weight after the operation. There were no operative nor postoperative complications, and he considered his recovery complete until a few weeks ago, when his symptoms of pain with nausea and vomiting reappeared. The vomitus does not seem to be of the "coffee-ground" type and apparently there has been no occult blood. Here is a carcinoma —and this is an important point—a carcinoma in a man twenty-six years of age, who presents all the classical symptoms of a typical ulcer, namely, pain coming on two hours after eating and being relieved by the taking of food. The chemical analysis at the time of operation was the chemical analysis we are accustomed to find in ulcer—a relatively high acidity, much free acid, and occult blood.

Now the fact I intend to point out this morning and the lesson I would like you to take from this case is the difficulty of distinguishing clinically between ulcer of the stomach and carcinoma of the stomach. These are the two conditions that will present themselves to you for diagnosis and treatment. In the conclusions that we hope to draw from our present analysis the great question will come up as to whether an ulcer of the stomach falls into the category of surgical conditions or whether it belongs in the realm of internal medicine, and whether it should be treated medically or should be treated surgically. You can appreciate that that is a most important question, and I think the question cannot be determined without our taking into consideration the essential and underlying fact that the difficulties of diagnosis are untold, and that no matter what a man's diagnostic acumen is and no matter what a man's medical or clinical experience has been, he has little right to assume from any symptoms or signs that he is dealing with a gastric ulcer rather than with a gastric carcinoma, or vice versa. Take this case as a case in point. Here is a man, twenty-six years of age, with a typical history of ulcer, and at operation an ulcer perforating the stomach wall was found. A carcinomatous ulcer is much less apt to perforate than an acute inflammatory ulcer. This case, therefore, falls into the classification of inflammatory ulcers because it did perforate. He showed a stomach analysis of gastric ulcer, and yet the microscopic picture showed carcinoma, and the man is back three months later with a palpable mass that is adherent to the scar.

There are certain factors in diagnosis which stand out and which should be weighed carefully when we are considering the question of whether we are dealing with an inflammatory or with a carcinomatous ulcer. The first factor in importance is the history; second, the physical findings; third, the x-ray; fourth, the stomach analysis. Certain of these features I hope to illustrate during the demonstration of the succeeding cases.

CASE II

The next patient I desire to present was operated on at Wesley Hospital in August, 1916. This man gave a typical history of duodenal ulcer. The history was typical in this respect, that he had been in the hospital before, that he had been treated, and had apparently recovered. I want to repeat that he *apparently recovered under medical treatment.* This man is one of the large percentage that the medical men are claiming to cure. He came back to *another* doctor two years later with the same symptom that he had before, namely, pain, which was relieved by eating. He had the hunger-pain. That is more characteristic of duodenal ulcer than any other symptom, though, in my judgment, it is not pathognomonic. I do not attach as much weight to that symptom as is accorded it by Moynihan. This man came back with recurrence of his former symptoms plus symptoms indicative of a partial obstruction of the pylorus. This partial obstruction of the pylorus was evidenced by vomiting and partial retention of food. The fact that there was retention, but that that retention was only partial, was indicated by the character of the vomitus which frequently contained food that had been eaten hours before, but never the entire meal—just occasional small particles. The *x*-ray showed that some of the bismuth was going through the pylorus and that the stomach did not empty readily. This man had no symptoms of acute bleeding. There was no blood in the stomach analysis. He had what we believed was a duodenal ulcer that had resulted in the development of a cicatrix with partial obstruction.

A gastro-enterostomy was done last September. It was a posterior gastro-enterostomy, with practically no loop. The jejunum was brought up and attached to the posterior wall of the stomach. When we went in we found an ulcer not of the duodenum proper, but apparently at the pylorus, extending on the anterior wall a little farther into the duodenum than into the pylorus. The pylorus was not shut off and the gastro-enterostomy opening was made 1½ inches long. Why do I go into these details? Because these are the questions that you are confronted with today in your practical work, and I am attempting to answer them by the demonstration of concrete examples.

This man ultimately made a complete recovery after resuturing of the abdominal wound, which ruptured on the tenth day after the operation. Since the operation he has had practically no trouble, though he is apt to suffer if he overeats, a disturbance which he had while in the hospital.

CASE III

This patient, upon whom we operated December 1, 1916, is fifty-two years old. He came into the hospital with the history that he had never been sick, that he had never had any disturbance whatever until about six or seven months before he came to the hospital. During that time he had been treated in various ways with diet and with medicines by various men without relief. He gave this history: Seven months before entering the hospital he began to have paroxysms of pain after eating which were relieved by vomiting; the pain and vomiting became worse; during the last two months he has vomited large quantities of fluid, which at times contained occult blood. He lost 45 pounds in weight during these seven months. The *x*-ray picture showed that there was an almost complete obstruction at the pylorus, but there were no filling defects. A tentative diagnosis of carcinoma was made. Why? First, because of his age, and second, because of the history. After the onset of his first symptoms, seven months before admission to the hospital, he went on rapidly to an obstruction of the pylorus. That would imply a rapidly growing affair. An ulcer usually produces obstruction by the formation of scar-tissue with the resultant contracting cicatrix—and that is usually a number of years in developing. The *x*-ray picture showed an almost complete blocking of the pylorus. This man vomited practically everything he ate or drank, sometimes retaining particles of food for several days before they were expelled.

At the time of operation we found, not a carcinoma, but a complete blocking of the pylorus from a duodenal ulcer just outside of the pylorus, a long, more or less annular ulcer which had resulted in a practically complete shutting off of the pylorus. This man's condition was not good. A rather rapid gastro-enterostomy was done. He has made an ultimate recovery. He left the hospital eleven days after the operation and came to my office four, five, or fifteen days later. He has steadily improved. He has never vomited since the operation. He has gained nearly 20 pounds in a little over six weeks. This was not a carcinoma, and, therefore, this man's ultimate recovery is beyond question, it seems to me, because it was an ideal case for a gastro-enterostomy. The question of whether we should or should not block off the pylorus did not come up here, for it was already blocked.

These are not selected cases. These are all cases done in the last year and a half. They are simply routine cases. I want to call your attention to the fact that there is no vomiting and no vicious circle and that they are having no disturbance, and yet the pylorus has not been closed in any of these cases. The gastro-enterostomy has been done without a loop, posteriorly, with the course of the jejunum corresponding to the direction of the flow of the gastric contents. The posterior side of the jejunum has not been turned up toward the left wall, as is sometimes done. I am not presenting these cases as the ultimate answer to the question of whether the pylorus should or should not be closed. I will confess to you frankly and freely that I am not yet convinced as to which is the better procedure. I will say that so far as I am personally concerned in the cases in which I did not close the pylorus I have had no vicious circle, and that I have had disturbances where I closed the pylorus. Again let me say that this is not the ultimate answer. The ultimate answer you gentlemen will have to make some day.

There is no tumor mass to be felt here today and this man is doing well.

CASE IV

This man came in presenting the typical picture of pernicious anemia, and the differential diagnosis had to be made between three things—between pernicious anemia and carcinoma of the stomach, and between pernicious anemia and ulcer of the stomach, or, if you like, between malignant or benign ulcer and pernicious anemia. He came in principally because of a hemorrhage that came from the stomach—a hemorrhage of bright red blood. That brings up the question, May a sudden hemorrhage —an emesis of bright red blood—occur in carcinoma of the stomach? The answer to that question is, positively, "Yes, it may." Rarely does such a hemorrhage occur from a malignant ulcer, but it may. I think I cited to you just a short time ago a case that came under my observation, a friend whom I had known all my life. I was called to see him and found him markedly anemic with a hemoglobin between 30 and 40 per cent. and a red-blood count of 2,000,000. He had had three large emeses of bright red blood. We went over his history carefully. He was perfectly well until he was taken suddenly sick with vomiting of that much blood, nearly a quart, enough to reduce his hemoglobin to 30 per cent. and the reds to 2,000,000. We went over the history carefully to see if we could detect any evidence of gastric ulcer or gastric carcinoma, and nothing could be elicited. There was no tumor mass to be felt; he had not lost in weight. That man succumbed in three weeks from the time of his first hemorrhage. He had no more hemorrhages after the first three. He did not succumb to the bleeding, of that we were convinced. An autopsy was granted and we found one of the largest carcinomas of the stomach that I have ever seen. It involved the whole greater curvature of the stomach, with some metastases in the lungs and a number of metastases in the glands, and yet he had not had the slightest evidence of being sick until three weeks before he died. I cite that again as evidence to show that no one can say at times whether an ulceration in the stomach is benign or malignant on the basis of the available data.

This man has been gone over very carefully, and a transfusion was considered, but it was found that the blood of the donor, his son, could not be used. However, he began to improve and improved rapidly. In our first blood count we found 874,000 erythrocytes to the cubic millimeter; today we find 4,448,000. The hemoglobin was as low as 20 per cent. Now it is 70 per cent. The *x*-ray picture showed that a six-hour residue was present. The duodenal bulb was not seen, but no constant defect was noted. The findings indicate an obstructive lesion at the pylorus.

The next question is, Can we eliminate pernicious anemia? Is this just one of the remissions that come in pernicious anemia? It seems to me that our *x*-ray picture helps us to decide that. It seems to me that an *x*-ray picture in which the anatomic bulb fails to appear and the presence of a definite six-hour residue helps to convince us that there is some obstruction to the duodenum, or the pylorus if you like. The vomiting of that much blood and the presence of a large amount of blood in the stools makes it appear that the anemia is a secondary anemia, secondary to severe gastric hemorrhages. Moreover, that severe gastric hemorrhage probably came from a benign and not a malignant ulcer. Why do I assume that? I assume that a malignant ulcer in this man would not have permitted the blood-picture to change so rapidly and so favorably as this man's blood-picture has. This man represents what? He represents the type of patient in whom we have to deal with a duodenal ulcer, presumably duodenal, because of the *x*-ray picture, but anyway an ulcer close to the pylorus, which is a gastric ulcer if you like, which has improved and is improving rapidly on medicinal treatment. Are we going to contend this morning that medicinal treatment does not cure a large number of so-called ulcerations in the stomach and duodenum? No! absolutely no! It is my conviction that medicinal treatment cures a very large percentage of duodenal and gastric ulcers. This is one of them. This is one of the cases in which it is extremely difficult to differentiate between pernicious anemia, malignant ulcer, and inflammatory ulcer. This, however, on the basis of the facts already mentioned, we believe is an inflammatory ulcer, and it is improving rapidly under medicinal treatment. Why do we presume that this patient has an ulcer? First, to go back to the history. The history is that the patient had trouble over a long period of time, culminating in a sudden severe hemorrhage, suggesting an inflammatory rather than a malignant ulcer. Second, the physical findings. The physical findings are those that one gets with a healing or healed non-malignant ulcer. These are not the physical findings that you get with a malignant ulcer. Such rapid improvement as this does not come with a carcinoma. Third, the *x*-ray pictures. The *x*-rays show no filling defect. Filling defects occur in carcinoma. Fourth, the stomach contents are those of an ulcer rather than a carcinoma.

CASE V

This man is fifty-nine years old and came in January 11, 1917, because of constipation and abdominal pain. He has been constipated for several years and has taken various cathartics to obtain a regular bowel movement. The pain in the abdomen has been periodic for the last ten years. The attacks last about three weeks. The pain is mostly in the epigastrium and spreads below the umbilicus. He has noticed no relation between the pain and eating, though he says a drink of cold water will relieve the pain. He belches much gas and feels uncomfortable after that. He says that eight years ago he took Dr. Sippy's treatment for gastric ulcer. He had typhoid fever at twenty. He had gonorrhea twenty years ago and a chancre at the same time. There has been no loss in weight. He drinks heavily. One sister died of cancer of the breast.

Examination shows a well-developed and well-nourished man. Temperature on admission was 98° F. Scalp, head, nose, and eyes are negative. Teeth are carious and pyorrhea is marked. Lungs and heart are negative. Pulse in the radial artery is good. Blood-pressure is 185 systolic and 105 diastolic. Urine and blood count are negative. Ewald test-meal showed a total acidity of 76; free 37; blood present.

Now what points of differentiation come out in this clinical picture? Here again we must attempt to differentiate between a simple ulcer and a malignant ulcer, and possibly one other factor, the question of a chronic alcoholic gastritis with no ulceration of the mucosa. Pernicious anemia can be excluded immediately. The important points in the history are: Recurrent attacks of epigastric pain with vomiting over a period of ten years; previous treatments for gastric ulcer; occasional hematemesis. That is a history that points to a non-malignant rather than a malignant ulceration. Next consider the physical findings. There is no tumor mass palpable. The appearance of the man is not that of a man suffering with a carcinoma. With carcinoma a man shows evidences of cachexia. Cachexia means what? It means loss of weight with a subicteric color and a wrinkling of the skin. It occurs in carcinoma and occurs quite independently of the degree of malnutrition the patients present as a result of the obstruction to the outflow of food from the stomach. We find this cachexia marked in patients who suffer no marked malnutrition from loss of food. Then what does cachexia mean? It must mean that these patients are suffering from a toxemia associated with carcinoma, and that this is responsible for the loss of weight and the loss of muscle tone. This man, then, so far shows no evidences of carcinoma.

We next examine the *x*-ray picture—it is negative. In further confirmation of our diagnosis, analysis of the gastric contents shows them to be most compatible with ulcer, that is, we find evidences of hyperacidity and a little blood.

What is the pathology of gastric ulcer? The cause of gastric ulcer, as we believe, is probably a disturbance in the circulation of the part ulcerated. That may be due to embolism, to thrombosis, or to blocking of the lymphatic circulation from some cause. Hyperacidity, I think, is a result rather than a cause of gastric ulcer. This man's history, as I have already pointed out, considered in the light of the physical findings and the results of gastric analysis, points to a gastric ulcer rather than to a carcinoma.

CASE VI

This patient I want to show you mostly for the purpose of emphasizing the difficulties of diagnosis. This patient came to us two years ago in May with a history of having had disturbance over a period of about three years, coming on gradually. The history was typical—pain after eating, regurgitation of gas, the pain relieved at first by the taking of soda or of food. Later the pain became almost constant and there was a great deal of nausea and vomiting, so that when she came to the hospital she was vomiting practically everything which was taken into the stomach. This patient at that time presented a picture of cachexia. The stomach findings, as I remember, showed a total acidity of 17 and no free hydrochloric acid. The *x*-ray picture showed a pyloric obstruction and the whole picture was classic of carcinoma. She had a palpable tumor which moved rather freely with respiration and which felt firm and nodular like a carcinoma. She was advised to have an operation.

When we opened the abdomen we found a large tumor at the pylorus with no material involvement of the peritoneum. I think one of the ways that you can differentiate pathologically between a malignant and non-malignant ulceration of the stomach is to note the peritoneum. If the peritoneum is not involved and can be moved on the underlying tumor mass, it is more apt to be a carcinoma than an inflammatory process. An inflammatory process is more apt to involve and go through the peritoneum. I thought it was a carcinoma and our medical man thought it was a carcinoma. She was running a pulse of 140 to 150. The medical man stood at one side and insisted that we do a resection. If you do surgery and have a medical man standing at your elbow assuming no responsibility, it is all right to be guided by his advice, but you must remember that what you do is your own act for which you are responsible; therefore, do not be too strongly influenced by the medical man. He says take out a liver or a spleen or 16 feet of the small intestine. It is mighty easy for him to stand about and say, "Do a resection of the stomach," but if he had that patient's life in his hands and from his experience knew that that patient would succumb from that resection, he would talk differently. This case points out very clearly the fallibility of our human judgment. I thought the lesion was carcinoma; everything seemed to point to a carcinoma. A gastro-enterostomy was done with the expectation of getting the patient built up and then doing a resection. This tumor was adherent to the liver. It is now two years since the operation, and this patient today is perfectly well. She has no disturbance at all, and the tumor has entirely disappeared without our ever getting to do our projected resection of the stomach.

What does this mean? It means that this was not a malignant tumor. It must have been an inflammatory mass so closely simulating carcinoma as to deceive some of the best medical men in Chicago. This patient came back to us week after week refusing the second operation. Today she is well—impressing us with the difficulty of distinguishing between malignant and non-malignant disease of the stomach. What else does this teach? That we must be just as careful, just as slow, and just as reserved in making a diagnosis of gastric ulcer and ruling out carcinoma. The converse of this case is always imminent, and we are very apt to err either way. I am not going this morning to enter into the controversy as to what part in the etiology of carcinoma simple inflammatory ulcer plays, though I am somewhat familiar with it, but I feel that I must repeat one statement which I made in discussing carcinoma of the breast: There is no such thing as a precancerous state; a lesion either is carcinoma or it is not. I think that you will agree with me when I say that the difficulty at times in differentiating between a beginning carcinoma and a beginning ulcer is almost insurmountable. I believe, and I say this with all kindness toward the men who are doing this work, that it is impossible at times for a pathologist to take a beginning carcinoma and say whether the ulceration he finds is the result of a primary or inflammatory ulcer, or whether it is the result of displacement of the epithelial cells with secondary degeneration. I do not see how he can. Then what must be our viewpoint? What must be the stand that we shall take? Just this: Recalling the period before the discovery of the cause of tuberculosis by Koch, many cases of tuberculosis were called something else, and many cases of something else were called tuberculosis. It is the same with carcinoma. Today, although carcinoma seldom is pathologically mistaken for something else, many other conditions are often called carcinoma. We are frequently not at all clear in our diagnosis. I think that advancement will be made much more rapidly if we assume that we do not know whether a gastric ulcer is one of the most common causes of gastric carcinoma or not.

CASE VII

This man has been complaining of gastric distress altogether about six years. This again brings up the question which we have discussed in a fragmentary way in connection with the preceding cases, that is, the relation between simple and malignant ulcer. Pathologists maintain, as do most clinicians, that gastric ulcer is a predisposing factor in carcinoma. They remind us of the fact that they so frequently encounter a long clinical history of ulcer preceding the carcinoma. I think it is justifiable to answer that in this way: We see carcinoma of seven, eight, nine, and ten years' duration, and in certain parts of the body of a period even in excess of ten years; a long clinical history, therefore, is hardly a safe reason for the exclusion of malignancy.

This man has been sick for a period of six years. He has had hemorrhages from the stomach, he has had pain when he took food. He was operated on a year ago last May after having had symptoms for five years. A growth was removed from the outlet of the stomach. He gained 40 pounds in weight after the operation. Then what happened? About a year afterward he became sick again and has been sick ever since. At the present time he vomits practically all he eats. This man comes in with recurrent symptoms. There is a little hernia at the upper end of the scar, which did not come until he was taken sick the last time. This is a history that looks decidedly like a carcinoma history, decidedly like a recurrence of what he had before. Can an obstruction recur? Can he get another ulcer? Yes, he can get another ulcer that might simulate very closely a carcinoma. He is cachectic, he has a mass in his abdomen that distinctly moves with respiration, a mass that comes down to the umbilicus, a mass that is more or less fixed, a mass that is more or less irregular in outline, and somewhat fixed to the anterior abdominal wall. It feels distinctly like a carcinoma. You cannot feel the edge of the liver. I am sure this is not the liver that comes down. We must admit in all fairness that this case certainly resembles, in its history, an inflammatory ulcer which has become a malignant ulcer. The *x*-ray picture shows that a six-hour residue is present. It shows a distinct filling defect, which is evidently due to a carcinoma. The cardiac opening and the lesser curvature are involved. There is undoubtedly an obstruction involving the lower portion of the esophagus. We must admit that this may be one of those cases in which a carcinoma becomes superimposed on a gastric ulcer, but, as I have pointed out, we cannot assume that this interpetation is correct beyond peradventure—the lesion may have been carcinoma from the beginning.

CASE VIII

This man had a gastro-enterostomy done a year ago last June for gastric ulcer that was producing some obstruction to the pylorus. He is having no trouble at all now. He eats everything. He has gained 37 pounds. We did a posterior gastro-enterostomy without closing the pylorus. I have not seen him for a year until today.

CASE IX

This patient came to us last June with a history running over a period of ten years. She had the typical and classic symptoms of a gastric ulcer plus an obstruction. She vomited everything she ate or drank. The stomach contents showed some free hydrochloric acid. They were not the stomach contents of a carcinoma. She had a large movable mass in the abdomen occupying the center line. We felt that it was probably a malignant growth. She was operated on, and we found a large indurated mass occupying about two-thirds of the lesser curvature of the stomach and extending down to the greater curvature, completely obstructing the passage of food. At the time of operation examination led me to state that the lesion was malignant. It seemed rather absurd to take out as large a tumor as that with which we had to deal, nevertheless we took it out by resection. At least two-thirds of the stomach was resected, just leaving a little stump at the pylorus. An end-to-end anastomosis was done.

This patient never vomited after the operation. She has never had pain. She eats everything that she wants to and has gained 54 pounds. She has no disturbance of any kind. This is not shown as the result of a brilliant operation. There are lots of things that seem more simple that are much more difficult to do than a resection of the stomach. It is shown for the purpose of illustrating what a patient is like six months after having had such a resection.

CASE X

This man came in with a long history running over fourteen years. He had a slowly perforating gastric ulcer. He was operated on December 12th, and at that time a posterior gastro-enterostomy was done by Dr. Oliver. He has gained 20 pounds. This question may arise: Will a patient with carcinoma improve and retain the ground gained for a long period when a posterior gastro-enterostomy is done? In my experience they improve sometimes very rapidly, but only for a few months. I have never seen a case of carcinoma in which a posterior gastro-enterostomy was done that showed a prolonged—that is, a lasting—improvement. I think those cases which are reported as being improved over a long period of time are not carcinomatous.

CASE XI

This is a girl who gives a history of having been sick for ten years. She came in with the typical findings of gastric ulcer, namely, the history of prolonged indigestion relieved by eating and relieved by soda, hyperacidity, vomiting, and occult blood. The trouble had grown worse in the last few months before we saw her, and she vomited practically everything she ate. *x*-Ray pictures, motor meal, and stomach analysis all showed a distinct obstruction at the pylorus.

At operation it was found that she had a small, more or less annular ulcer just inside the pylorus on the lesser curvature, practically completely blocking the pylorus. The stomach was enlarged. A gastro-enterostomy was done and the patient has made a fairly good recovery, not so brilliant as some of the others. She has had a little disturbance since the operation. She tells me that she vomited about two weeks ago. She has gained $10\frac{1}{4}$ pounds since the operation on September 11, 1916.

Now the question comes up: What deductions are we to make from the cases we have seen this morning? I say this in all fairness, I hope, to my medical colleagues: Our medical statistics show that about 85 to 90 per cent. of gastric and duodenal ulcers will get well with good feeding and proper care. I wish to take issue with that statement. I believe that a large percentage of gastric and duodenal ulcers will get well under medical treatment, but I do not believe that 90 per cent. get well. One thing which renders these statistics fallacious is the fact that the medical man cannot get all the evidence. When a case recurs and recurs, it goes to the other man, and therefore the first doctor's statistics are incomplete. He also draws another conclusion which I believe is fallacious, and I think you will agree with me if you watch your medical clinics. The internist gets a case in which a gastro-enterostomy has been done, and he finds that the patient has not been cured. He shows the case to you and to the medical profession as a case that surgery did not cure. The argument is fallacious again because they only see the cases that do not get well. The ones that get well by surgery do not go to the medical man. It is only the cases in which the result is not good that go back to the medical man. We have showed you this morning many cases that got well by medical treatment, and there are a lot of them, but the percentage is not 90.

Bringing up the question of what you should do in the individual case: First, make as accurate a diagnosis as possible; second, institute a strict medical régime, the basis of which is rest, diet, alkalies, and, in selected cases, gastric lavage; and then, if the trouble recurs and recurs, that case becomes a surgical case. If bleeding persists or if there is pyloric obstruction, again the condition becomes surgical. If it is not reasonably possible to make a diagnosis of simple ulcer in contradistinction to malignant ulcer, the patient should have the advantage of an early operation.

Just a word with regard to closure of the pylorus: I am not closing the pylorus except in rare cases. I have not had occasion to observe that procedure over a long period of time. I think I have had less disturbance with vomiting and the recurrence of symptoms in the cases in which I have not closed the pylorus than in the cases in which I have. However, I am still open to conviction.

CLINIC OF DR. FREDERICK G. DYAS

COOK COUNTY HOSPITAL

REMOVAL OF ABDOMINAL TUMORS UNDER LOCAL ANESTHESIA

Summary: Two cases illustrating the great value of local anesthesia for abdominal work in the presence of conditions in which ether anesthesia is contraindicated; the Farr infiltration apparatus and table for visual exploration of the abdomen without the employment of traction on the viscera.

LOCAL anesthesia is now recognized as a life-saving measure in those cases in which it is impossible to administer a general anesthetic. Every large hospital furnishes almost daily cases in which were it not for local anesthesia the patient would stand absolutely no chance of recovery. The purpose of this article is to point out the extreme cases which may be successfully operated under local anesthesia and to illustrate by two recently operated cases the technic of administering local anesthesia.

Cases of large abdominal tumors frequently require operation as an emergency measure, and either through conditions brought about by the tumor itself or by conditions outside of the abdominal cavity will suddenly become grave. The patients are so handicapped by the presence of a large abdominal tumor that the only hope lies in relief of the mechanical conditions brought about by the presence of the neoplasm. This last class of cases is illustrated by Case I.

CASE I.—A telephone operator, twenty-nine years of age, was admitted to Cook County Hospital January 5, 1918, complaining of pain in the right side, slight fever, and general weakness. She had left the hospital four days previously believed to be fully convalescent from a pneumonia which had had no definite localized signs. She also had an ovarian cyst of five months' standing, which was about the size of a full-term pregnancy. Before leaving the hospital she had been advised to remain and have this cyst removed.

After leaving the hospital she felt well for three days, when she began to have sharp pain in the right side of the abdomen on attempting to rise from her chair. This was not accompanied by nausea or vomiting. The pain was relieved by lying down, but was accentuated by moving to either side, coughing, or upon straining movements, such as movement of the bowels or urination. She had no chills or vomiting.

Five years previous the patient had had an appendectomy, a right-sided oöphorectomy, and salpingectomy.

Upon examination her pulse was 118, respirations 22, and temperature 102° F. Leukocyte count was 12,000.

Physical examination revealed scattered râles over the left lower lung posteriorly. The heart was negative. She had a severe racking cough and brought up large quantities of sputum. The face was flushed and the tongue heavily coated. The abdomen was markedly distended with fluid. Percussion note was flat about the umbilicus and it was possible to detect waves of fluid within the abdomen. There was tenderness and muscular rigidity over the lower right quadrant of the abdomen.

Upon vaginal examination an indefinite fluctuating mass was to be felt in the posterior culdesac.

A diagnosis of ovarian cyst with twisted pedicle and acute diffuse bronchitis was made.

Examination of the sputum showed no tubercle bacilli. The patient ran a temperature varying from 100° to 103.6° F., but on January 11th, six days after admission, the temperature dropped to normal. On the 12th she was transferred to the surgical service for operation, as the quantity of fluid within the abdominal cavity was rapidly increasing in amount and her respiration was greatly embarrassed.

Operation (January 12, 1918).—The usual abdominal preparation was made and a local infiltration of the skin and subcutaneous tissues was made, reaching from about 2 inches above the umbilicus well down toward the symphysis pubis (Fig. 172).

An incision was made through the welt produced by the infiltration down to the fascia. A second line of infiltration was then made extending down through the peritoneum. The peritoneum was opened and the cyst exposed. A large trocar was introduced into the cyst and immediately a thick, dark brownish fluid escaped. In all, 10 quarts were removed. After removing as much of the fluid as possible with the trocar, the cyst wall was incised and it was found to contain numbers of daughter cysts (Fig. 173). It was possible after the evacuation of the fluid to bring out the entire cyst through the abdominal wall, exposing its attachment down to the left broad ligament. At this step of the operation it was necessary to administer a small amount of nitrous oxid and oxygen while the clamps were

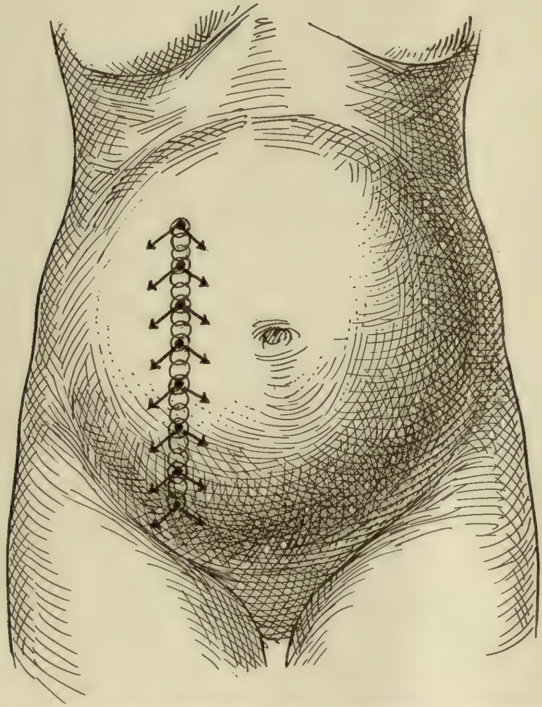


Fig. 172.—Removal of large abdominal tumor under local anesthesia—line of infiltration.

applied to the pedicle and the cyst attachment severed. The pedicle was sutured over in the usual way by heavy catgut running suture and the abdomen closed without drainage.

The patient made an uneventful recovery from the operation and the skin clips and deep silkworm stitches were removed one week later. There was a slight infection of the skin wound, which rapidly healed up. The bronchitis improved markedly and the patient left the hospital at the end of one month apparently well.

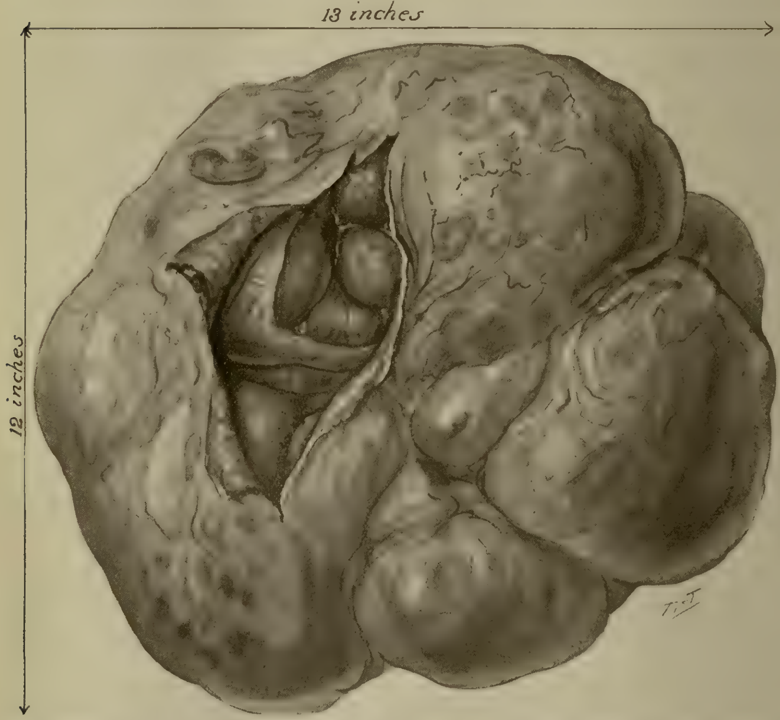


Fig. 173.—Large multilocular ovarian cyst showing daughter-cysts removed under local anesthesia.

This illustrates a case of acute extra-abdominal lesion complicated by a large abdominal tumor. Because of the respiratory embarrassment and the acute diffuse bronchitis ether anesthesia was not to be thought of. The patient complained of no pain under the local anesthesia. The use of the nitrous oxid and oxygen was not at the request of the patient, but was resorted to in order to save time at the close of the operation in a situation where local anesthesia is difficult to obtain.

CASE II.—The second case concerns a woman of twenty-seven years, who came into the hospital on October 14, 1917, complaining of swelling of the abdomen, abdominal pain, loss of weight, and cough.

She had felt quite well up until three months before admission. Since that time the abdomen had been getting progressively larger and at first she thought she was pregnant. She noticed, however, that she was losing weight rapidly, but was unable to state how many pounds. The cough has been present for the past two weeks.

On examination the entire left lung was found to be flat, with greatly diminished breath sounds. Dulness was present over the entire abdomen, which was greatly distended with fluid. There was very little evidence of collateral venous circulation in the abdominal wall. However, upon palpation masses of various sizes could be felt through the abdominal wall, and these seemed to be part of a large tumor. There was some edema of the legs, possibly due to the pressure of the tumor.

Examination of the urine, sputum, gastric contents, and stools was negative. The right chest was tapped many times and large amounts of a serofibrinous fluid were removed, with a specific gravity of 1020. The abdomen was tapped on several occasions and large amounts of hemorrhagic colloidal fluid removed. The Wassermann test was negative.

A diagnosis of tuberculous pleurisy with effusion and tuberculous peritonitis with ascites was made. Later, when colloidal material was obtained on tapping the abdominal tumor, a diagnosis of malignancy of the ovary was made.

The patient left the hospital on December 23d and returned later because of the increasing severity of the symptoms. She was then transferred to the surgical service.

Operation.—The operation was performed under local anesthesia, the infiltration of the abdominal wall extending from about 2 inches above the umbilicus to close to the symphysis over the right rectus muscle. The abdomen was opened without pain to the patient and disclosed a large, irregular, lobulated mass. Upon introducing a trocar into this mass only a small amount of fluid was obtained. An incision was then made into the mass, and it was found that the outer cyst wall contained many smaller tumors, which were fused together. Fortunately, the cyst wall was not attached to the peritoneum or to any of the intraperitoneal viscera. It was possible then to luxate this enormous tumor through the abdominal incision. At this point recourse was had to nitrous oxid and oxygen, the pedicle of the tumor clamped and severed, and the stump sutured with running catgut. The abdomen was closed without drainage.

The patient did nicely until the fifth day, when she died of exhaustion. Unquestionably this patient should have been operated at an earlier period before her cachexia became so marked.

Upon examination of the tumor no evidence of malignancy was found, the clinical diagnosis being cyst of the ovary.

The lesson taught by this case is that abdominal tumors in which an absolute diagnosis cannot be made will have a possible chance of recovery by an early laparotomy under local anesthesia. Local anesthesia *per se* is without danger and in practically every case affords opportunity for intra-abdominal inspection and exploration without pain or danger to the patient. Robert Emmett Farr, of Minneapolis, has introduced a very useful method for infiltration of the tissues. In effect his apparatus consists of a buret graduated into fractions of a cubic centimeter and filled with the anesthetizing solution. A rubber tube is attached to the lower end of the buret and this is, in turn, connected with a needle. Positive pressure is produced within the glass buret by means of a rubber bulb, which pumps air into the buret above the liquid, thus forcing the solution out of the buret and through the needle into the tissues, enabling the operator to read off at a glance the amount of solution used. This helpful apparatus also obviates the necessity of syringes, which are constantly getting out of order.

Another useful suggestion of Dr. Farr's is the employment of a suitable table which changes the posture of the patient for visual exploration of the abdomen. By moving the patient from side to side and into the Trendelenburg position or reversed Trendelenburg position it is possible by utilizing the force of gravity to bring much of the intraperitoneal contents in review before the eye without the use of traction upon the viscera. One's ability to explore the abdomen under local anesthesia increases with practice and the postural method adds greatly to the comfort of the patient and minimizes the amount of traction required to expose the viscera.

The solution used in both of these cases was $\frac{1}{2}$ of 1 per cent. apothesin.

USE OF THE HOGLUND BONE TRANSPLANT FOR UNUNITED FRACTURES OF THE TIBIA

Summary: **A patient presenting a spiral fracture of both bones of the leg in which satisfactory reduction could not be maintained by external fixation; the Hoglund intramedullary bone-splint—technic of its use—results.**

The patient, a dressmaker, thirty-five years of age, slipped on a wet floor and fell with her left leg beneath her. She felt the bone give way and heard it crack. She was immediately brought to the hospital and the classical signs of fracture found, namely, evidence of local trauma, loss of function, crepitus, deformity, and false point of motion. The fracture had not compounded, but there was a great tendency for the lower fragment of the tibia to pierce the overlying skin.

A skiagram revealed a spiral fracture of the lower third of the tibia and a fracture of the fibula at its upper third. Attempts at reduction under anesthesia were without success, the skiagrams showing that there was about an inch of overriding of the fragments of the tibia. It was decided that an open operation with mechanical immobilization of the fragments would be the only means of securing adequate reduction and fixation.

Operation.—Under ether anesthesia an incision was made from a point about 3 inches above the articular surface of the tibia and along its flat surface to a point slightly above the external malleolus. The soft tissues and the periosteum were retracted to either side and the bony fragments brought up out of the wound and freshened by means of a sharp curet and a rongeur forceps.

It was decided to use the method of transplantation advocated by Dr. Emil Hoglund. By means of a motor-driven saw two parallel cuts were made in the upper long fragment of the tibia extending from a point about 1 inch above the fractured surface for 5 inches along the shaft of the bone. These longitudinal parallel cuts were united at either end by a transverse cut with the chisel (Fig. 174, 1). The fragments were then held in alignment and an attempt made to push the transplant

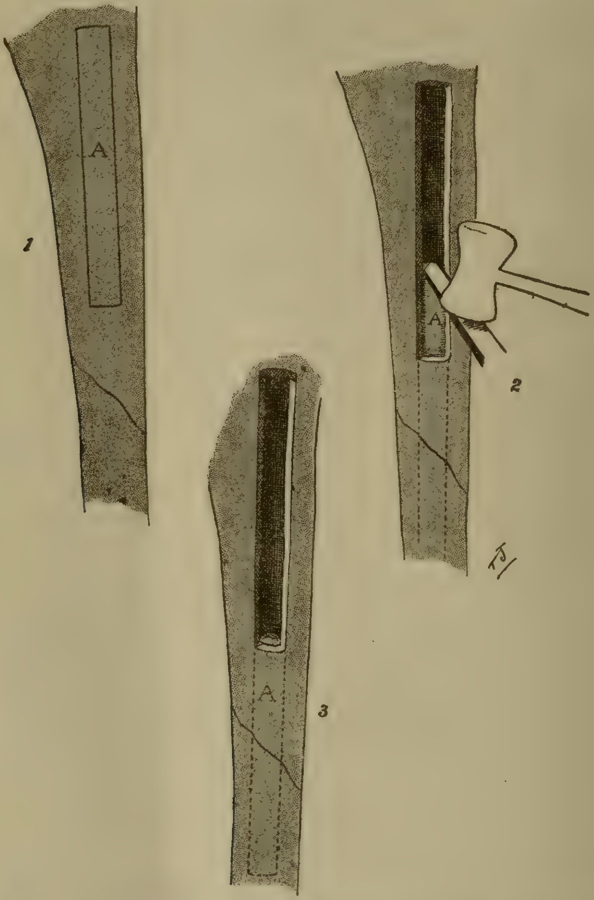


Fig. 174.—1, *A*. Outline of transplant made by parallel longitudinal cuts with twin saws driven by electric motor. Loosened at ends by transverse cuts with narrow chisel. 2. The transplant depressed into medullary cavity and carried downward by means of a few hammer blows against the flat surface of a chisel pressed against upper end of transplant. 3. Showing transplant in place and space left by its removal.

into the medullary cavity with the idea of driving it down through the medullary cavity until it bridged over the two fragments of the bone. Unfortunately, this was not possible, for the reason that the longitudinal saw cuts had been made with a single circular saw rather than with the twin saws, and as a result of this the direction of the saw cuts was such that a trough-like cavity resulted, so that in effect the transplant was a wedge, being broader upon its cortical surface than upon its medullary surface. Upon discovering this error the transplant was removed and introduced from below into the lower end of the upper fragment. The two bony fragments were then brought into alignment and the transplant, which now could be seen through the trough-like opening in the upper fragment, was easily carried downward through the medullary cavity until it bridged over the fracture and reached to the lowest portion of the medullary cavity of the lower fragment (Fig. 174, 2, 3).

The principle of this method must appeal to every one, because where the twin saws are used it is unnecessary even to lift the transplant out of its bony bed. It is merely depressed into the medullary cavity and driven on downward until it bridges over the line of fracture. The simplicity of the method must recommend it to all those who do much bone surgery. It has the further advantage of not incapacitating the other leg, as it was formerly the custom to remove the transplant from one limb and introduce it into the bone of the opposite side.

In the case above described the patient showed signs of a slight infection about the tenth day. This was treated with bismuth paste and rapidly healed up. No interference with bony union took place and the patient has a strong line of union with perfect anatomic restoration now two months after the operation.

CLINIC OF DR. NELSON M. PERCY

AUGUSTANA HOSPITAL

TUMOR OF THE GASSERIAN GANGLION

Summary: History and physical examination of patient—the diagnosis—differentiation of tic douloureux, infection of sphenoidal sinus, and tumor; operation; histology of tumors of the gasserian ganglion; postoperative history of the present case.

The patient is a male thirty-one years of age; a farmer by occupation. His family history is negative, as are also his marital and past medical histories. Habits are negative, and he denies any venereal history.

He comes to the hospital complaining of pain in the right forehead, right ear, and right side of face. The trouble started in January, 1916, when the patient noticed pain above the right eye. The pain was dull in character and severe, with intermittent increase in severity. The exacerbations had no recognized provoking cause. About one year later the patient began to have similar pain along the right lower jaw. At this time the pain was continuous, with periods of severe exacerbations. About April of this year pain of a similar character appeared under the right eye and over the right cheek. At times there are sharp shooting pains in the right ear. For the past six months there has been a sense of "numbness" in the right cheek and jaw, and also during this time there has been noticed a gradually developing atrophy of the muscles of the right side of the face and jaw. For some time past he has been unable to open the jaw to the former normal extent.

A few months ago the patient went to one of our prominent clinics, and an infected right antrum was found and drained. Practically no relief was obtained from this. A few weeks ago, at another clinic, the inferior dental nerve was resected and the infra-orbital nerve injected with alcohol. Very little relief resulted from this, and one week later the inferior dental nerve was injected with alcohol. Some relief from this was obtained for a short time, but soon became worse again, and for the past month the patient has suffered continuously night and day. During the past week he has used opiates freely, from which he has not been able to obtain much rest. He has lost 50 pounds in weight during the past few months. There has been no nausea or vomiting, nor any failing of vision. No tinnitus nor vertigo. There has been questionable diplopia.

Physical Examination.—The patient is a well-developed and only fairly well-nourished male. The mental state is dull and the patient is childish. Color of skin and mucous membranes is good. Examination of the chest, lungs, heart, blood-vessels, abdomen, genitalia, and extremities shows entirely negative findings. Reflexes not remarkable. Peripheral lymph-nodes nowhere enlarged, save for slight enlargement of the inguinal nodes on both sides. The interesting findings are confined to the head. The skull is symmetric and shows no exostoses, depressions, or tender areas. Scalp clean and without scars. The facial expression is dull. The skin of right side of face is more red and is warmer than that of the left. There is a slight sagging of the right cheek, but no definite atrophy is found. Sensation totouch is diminished to absent over the right forehead, cheek, and jaw.

Eyes.—There is a marked conjunctival injection in the right eye, and considerable swelling in and about the two right eyelids. There are blephoraspasm and photophobia on the right, while the left shows no such findings. The pupils are equal, regular and round, and react well to light and accommodation. No ptosis nor nystagmus. There is present an external strabismus on the right, which varies in degree, increasing with the performance of the remaining extra-ocular movements, which are otherwise well performed. No gross disturbance of vision made out.

Ears.—Negative, except for slight impairment of hearing on the right.

Nose, negative. Teeth in good condition. Tongue clean, protruding in midline.

There is marked limitation of movement of lower jaw, patient being unable to separate the teeth more than 1.3 cm. Motion of jaw not painful. Inspection of throat difficult on account of inability to open mouth.

The urine is negative. One Wassermann test on blood-serum was negative; another was slightly positive. Ten days ago an attempt was made to inject the inferior and middle branches of the fifth nerve with alcohol, but very little relief followed. While the patient is never free from pain, the suffering is worse at night than during the daytime. During the past few days the patient has taken from 2 to 3½ grains of morphin each night, and then was not entirely relieved.

COMMENTS BY DR. PERCY

Diagnosis.—It seems likely that we are dealing with a tumor of the gasserian ganglion. It is evident that it cannot be simple tic douloureux because of the paralysis of the sixth nerve. The pain in this case became continuous soon after the beginning of the trouble and has persisted since, while in tic douloureux the pain is never so persistent, but is intermittent in character and comes in spasms. There really has been no interval of relief from pain in this patient from the beginning of his trouble. Infection of the sphenoidal sinus might cause a severe, persistent pain in the region of the distribution of the fifth nerve, but would not be likely to cause paralysis of the sixth nerve. Tumor of the gasserian ganglion is extremely rare, but still, with the history of the severe, persistent, continuous pain, with involvement of the sixth nerve, and the absence of other symptoms pointing to a brain tumor or to an infection of the sphenoidal sinus, it seems that on these symptoms alone one is justified in making a probable diagnosis of tumor of the ganglion.

Operation.—The patient has been anesthetized with ether and placed in the reverse Trendelenburg position at an angle of 45 degrees. A needle threaded with catgut is passed around the temporal artery and tied. This controls most of the hemorrhage from the scalp-flap which is to be made. A running catgut suture is now placed in the scalp, taking in an area of the scalp

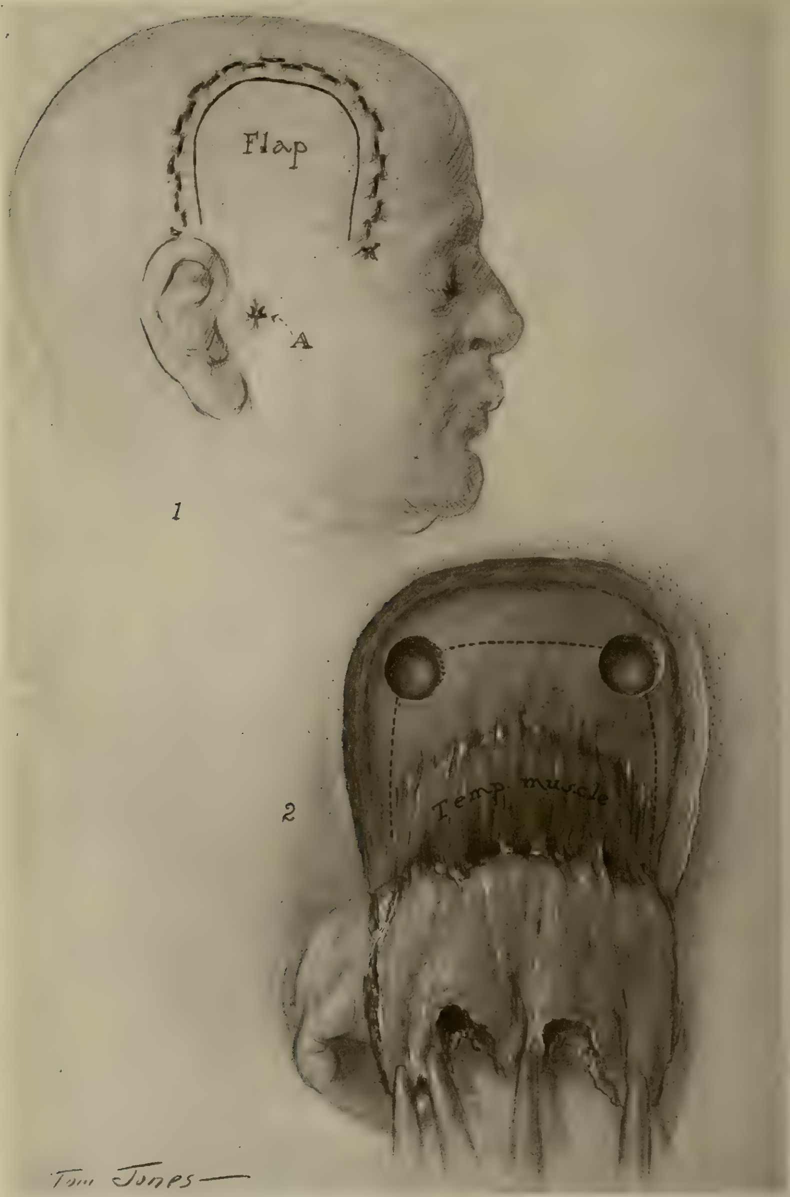


Fig. 175.—1. Outline of osteoplastic flap to be turned down. Note continuous hemostatic suture; *A*, ligature on temporal artery. 2. Second step in formation of osteoplastic flap. Trephine openings and line for incision through the bone.

a little larger than the proposed scalp-flap. This suture begins at the base of the flap in front and extends around to the base posteriorly and back again to the starting-point. When pulled tight and tied it prevents bleeding from the scalp distally (Fig. 175, 1). The inverted U-shaped scalp-flap is made and two holes trephined in the skull, and the bone-flap sawed by means of a rotary electrically driven chain saw (Fig. 175, 2). The dura is now carefully separated from the skull and the temporosphenoidal lobe of the brain is lifted from the middle fossa of the skull, first with the fingers, and then by retractors (Fig. 176, 3, 4). As the brain is lifted upward you can see a tumor lying in the middle fossa of the skull, entirely extradural. It is not attached to the skull nor the dura, but looks as though it were attached to the gasserian ganglion only. Our next step will be to ligate the middle meningeal artery just distal to where it comes out of the foramen spinosum. This procedure will be more difficult than usual because the tumor is in our way. By retracting the tumor forward the foramen spinosum is exposed, and I will carry a fine silk ligature around the middle meningeal artery and ligate at two points and cut between (Fig. 176, 4). Now, as the brain and dura are retracted further upward you can see that the base of this tumor comes from the gasserian ganglion (Fig. 177, 5). Fortunately, so far there has been very little bleeding; in fact, much less than during the usual ganglion operation. On account of the size of the tumor, which is about 3.5 by 2.5 cm., it is impossible to expose the individual branches of the ganglion, so I will first remove the tumor as close to the ganglion proper as is possible, and afterward remove the ganglion.

A pair of curved forceps is placed as near the base of the tumor as possible, and the growth crushed off in this manner. This gives us a good view of the ganglion. The inferior branch of the ganglion is now exposed as it enters the foramen ovale and is severed at this point. By working a little forward the middle branch is exposed as it enters the foramen rotundum and is cut. You will note that the ganglion is abnormal in consistency. It is very friable and crushes to pieces easily from the grasp of the forceps. I will not try to demonstrate the first branch of the

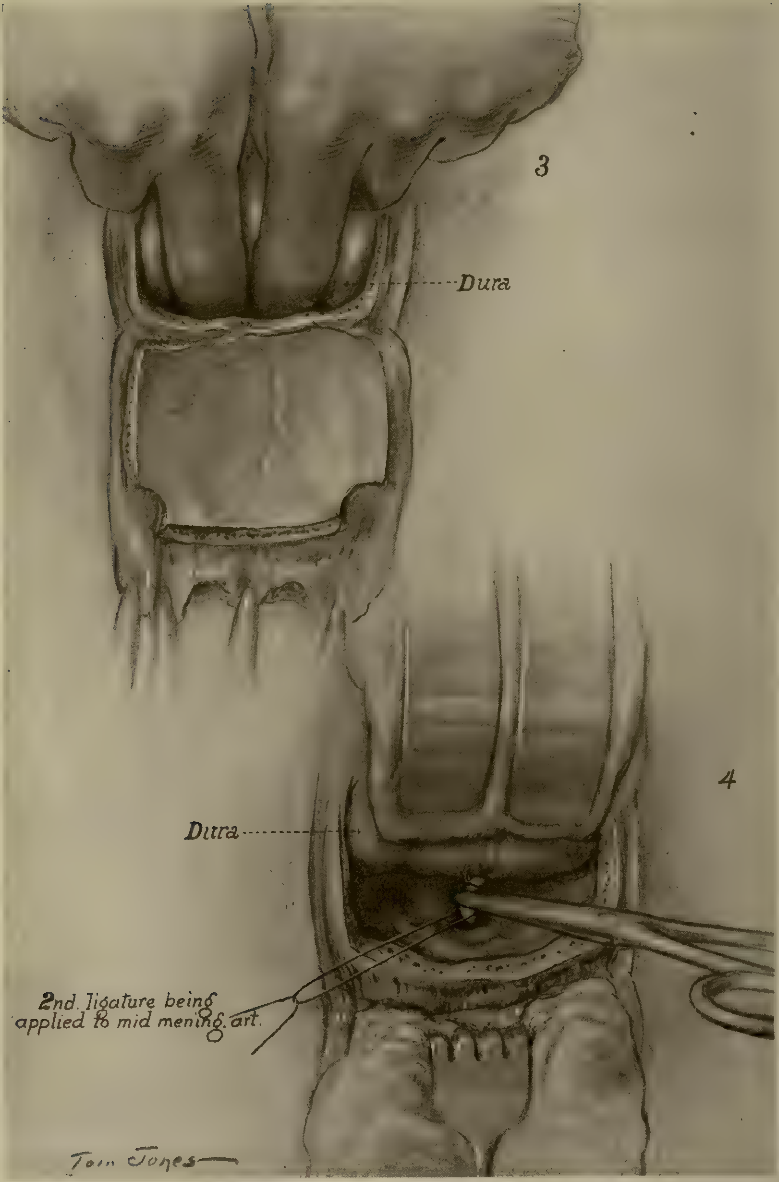


Fig. 176.—3. Osteoplastic flap turned down and fingers inserted for the purpose of separating the dura from the skull. 4. Double ligation of middle meningeal artery at foramen spinosum.

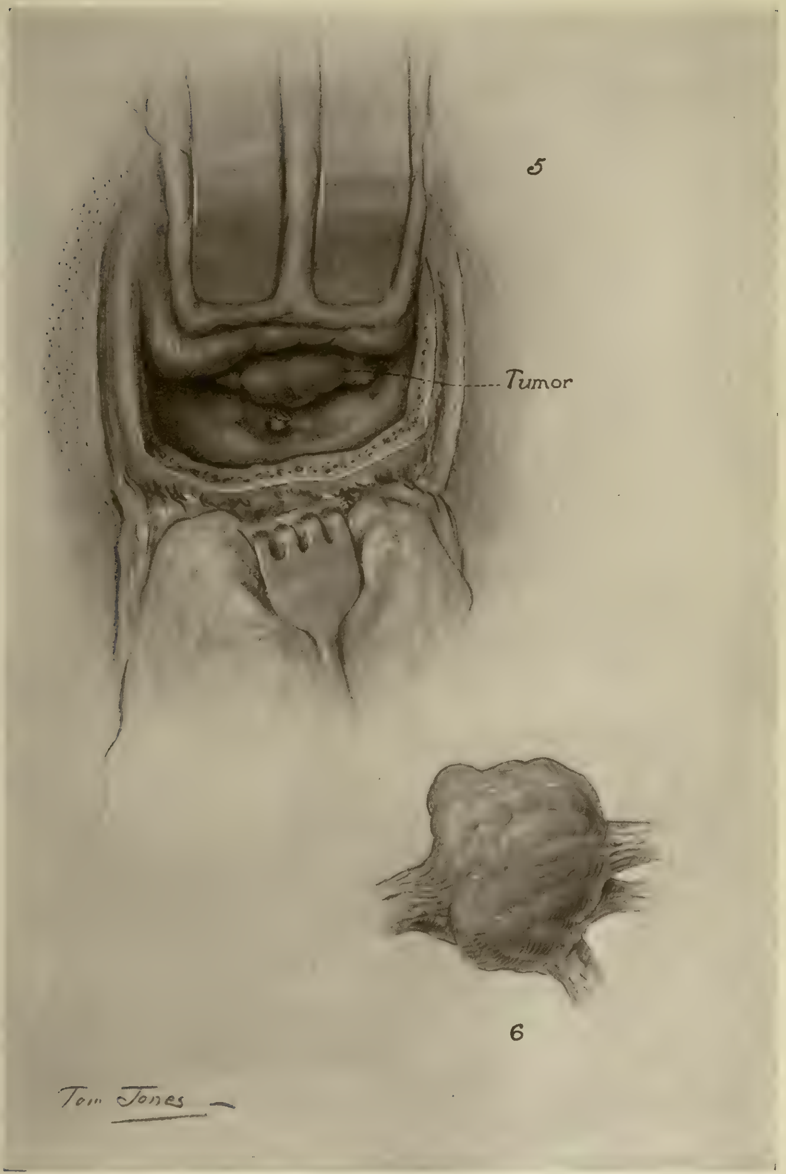


Fig. 177.—5. Middle meningeal cut between ligature and dura further retracted, bringing the tumor into view. 6. Gross appearance of tumor.

ganglion, as it lies in too close relation with the cavernous sinus. The dura is now separated from the upper surface of the ganglion by means of this blunt dissector. The escape of the cerebrospinal fluid which you now see indicates that the dura has been opened during this dissection. What is left of the ganglion is now removed by grasping it toward its posterior portion with a pair of hemostatic forceps and making traction along the axis of the nerve. This extracts the ganglion together with a portion of its root. The hemorrhage is quite free now, but will probably stop after tamponing the bleeding area with gauze for a few minutes. If it does not cease in a few minutes from the packing the end of this gauze pack will be brought out from the angle of the wound, and the pack left in place for twenty-four hours. We will now remove this tampon, which has been in place for about five minutes. You see, the hemorrhage has ceased entirely, so we may close the wound without drainage. The retractors holding the brain upward are now removed and the brain allowed to settle down into the middle fossa of the skull again. It is rather slow in doing so, but within a few minutes it will settle down into place. In this case the bone-flap will be left out, and, in addition to that, I will enlarge the opening in the skull with the bone-biting forceps, working posteriorly and low down. This is done for the purpose of making a permanent decompression. This tumor is undoubtedly malignant, and the chances are that there will be a recurrence, and the patient will live longer and be more comfortable with the decompression than without it. The wound is now closed without drainage.

The eye on the side where the ganglion has been removed will require special attention for some time to avoid irritation and ulceration. I will place these two silk sutures in the lids to keep the eye closed for a few days. After the stitches are removed from the lids the eye will be protected by a watch-glass shield held in place by adhesive plaster. The eye will also be irrigated frequently with boric acid solution. These precautions are usually sufficient to prevent ulceration of the cornea.

Tumor.—The growth was 3.5 x 2.5 x 1 cm. in size, and was constricted somewhat at its center (Fig. 177, 6). The tumor was closely connected with and apparently included the ganglion. It had a definite reddish fibrous capsule and was well defined, being attached only at the gasserian region. The tumor, on section, was found to be of firm consistence, and the cut surface was lusterlous, white, and striated. The mass was uniform in these respects throughout. Microscopic sections showed the type of cell, for the most part, to be elongated, narrow, and oval. However, in certain places the cells are almost round. The elongated cells are parallel. In some regions the connective-tissue stroma is rich and the tumor cells occur in patches of alveolar formation about the vessels. In other places the field is almost entirely made up of tumor cells. A rare mitotic figure is seen. No giant cells are found. There are fibrils, free from the cells, varying from fine to coarse, and in places forming a tangle. The fibrils are not markedly numerous.

It seems to be difficult to decide on the nature of the growth removed. Sections of the tumor were studied by different pathologists, and the diagnoses suggested were neurofibroma, fibrosarcoma, and endothelioma. In other reported cases of tumor of the gasserian ganglion the pathologists have not always agreed upon the nature of the growth. Sachs, in reporting his case in the Annals of Surgery, August, 1917, classified the tumor as most probably being an endothelioma. Sachs writes: "A considerable number of these tumors have been studied pathologically. In the last fifty-two years the literature contains 37 cases. These have been reviewed with particular care as to their pathology by Marchand and Giani. Though various diagnoses have been made in these cases, varying from carcinoma to sarcoma and endothelioma, the consensus of opinion has been to call them endotheliomata. It seems probable that at least some of these cases called carcinoma belonged to the endotheliomata."

Convalescence.—There were no symptoms of shock following operation, and the patient made a good convalescence. He had been taking from 2 to 3½ grains of morphin daily previous to operation, and required some morphin for about one week following operation. The wound healed kindly and stitches were removed on the eighth day. A couple of days later the wound began to drain serum through a couple of stitch holes. This drainage persisted for a number of days. The patient left the hospital about four weeks after operation, free from pain for the first time in nearly two years. I have heard nothing of his progress since leaving the hospital. A recent letter of inquiry, while not returned, brought no response.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

INJURIES OF THE CHEST IN CIVIL LIFE AND WAR

Summary: Presentation of 5 cases illustrating the diagnosis, complications, and treatment of fracture of ribs, hemorrhage, pneumothorax, serous and suppurative intrapleural effusions, emphysema, and the late complications resulting from fibrous tissue development and contracture in thoracic wounds; a summary of battle-field surgery of the chest as developed on the West front.

I desire to show you today 5 cases illustrating various phases of injuries of the chest as we observe them in a large metropolitan hospital, *i. e.*, the injuries of civil life. After presenting the chief features of these cases I will review some of the principal features of war surgery of the chest.

Summary of Case I.—Multiple fracture of ribs; hemopneumothorax with pressure symptoms on heart and mediastinum; extreme subcutaneous emphysema; multiple aspirations of chest; recovery.

The first patient is a man fifty-eight years of age who was brought to the hospital four weeks ago after falling from a ladder a distance of about 12 feet and striking the left side of his chest. I examined him about three hours after the injury and found a false point of motion over the seventh, eighth, and ninth ribs from the axillary line to the spine, indicating multiple fractures of these ribs, a finding which was later confirmed by *x*-ray examination. In addition to these evidences of fractures I found a wide-spread subcutaneous emphysema extending from the median line behind to the median line in front, and from the clavicle above almost to the costal arch below. The lips and nails had a distinct cyanotic tinge and there was marked dyspnea. The pulse was rapid (120) and small and there was slight hemoptysis. Percussion showed an area of dulness about the width of three fingers at the lower portion of the chest, and above this a markedly tympanitic sound. The heart was displaced greatly toward the right.

Our diagnosis was multiple fracture of the ribs with injury to the lung, which resulted in the escape of blood and air into the pleural cavity and gave rise to the physical findings of hemopneumothorax just described, and also allowing the escape of air into the subcutaneous tissues of the chest wall.

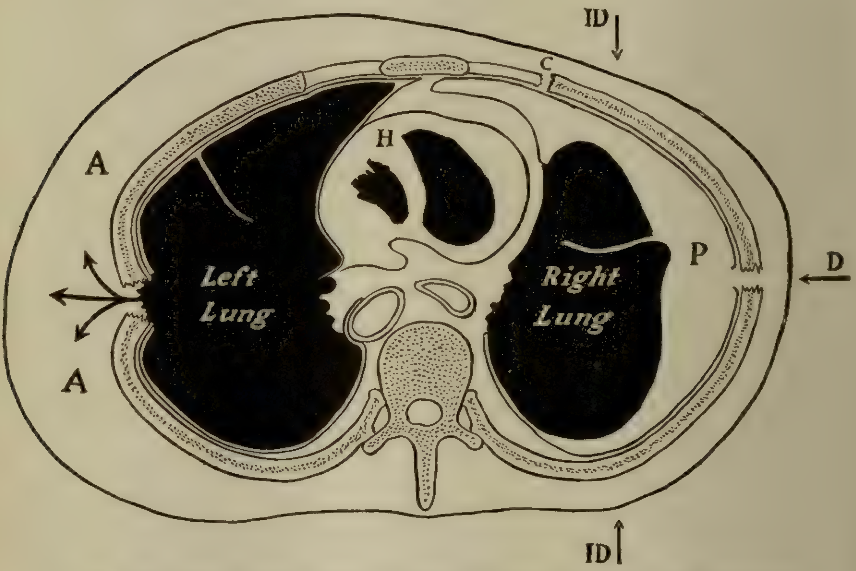


Fig. 178.—Cross-section of thorax (diagrammatic) to show mode of production of pneumothorax or hemothorax and of subcutaneous emphysema as a result of fractures of the ribs. *ID*, The arrow accompanying these letters shows the mode of action of indirect force in producing fracture of the ribs; *D*, mode of action of direct force in producing fracture of the ribs; *P*, pneumothorax as a result of fracture of the rib and laceration of the pleura on right side; *A*, extensive subcutaneous emphysema as a result of puncture of a lung by the sharp ends of a fractured rib fragment; the triple arrow shows the mode of egress of the air from the punctured lung into the subcutaneous tissues; *H*, cross-section of heart; *C*, fracture at costochondral junction without displacement. (Keen's Surgery.)

In connection with the diagnosis of this case let me emphasize at this time the great value of a fluoroscopic examination of the chest combined if possible with plates taken by the stereoscopic method. The *x*-ray examination of the patient at the time of admission to the hospital showed a collapse of the left lung and a displacement of the heart and mediastinum toward the right. There was a moderate amount of fluid at the lower portion of the left pleural cavity, and above this (Fig. 178) the extreme clearness of the chest picture showed that the major portion of the displacement of the heart and mediastinum as well as of the lung collapse was due to a very marked pneumothorax.

On account of the absence of communication of such a hemopneumothorax with the external air it is commonly spoken of as a closed one, to distinguish it from a similar condition where there is a free communication between the pleural cavity and the external air, to which the term "open pneumothorax" is applied. Of course, you must remember in connection with the latter term that an open pneumothorax may be converted spontaneously into a closed one if the wound of communication between the pleural cavity and external air becomes sealed during the healing process, or if it is artificially closed by gauze packing or by an operation which brings the soft parts into approximation and converts the open into a closed pneumothorax.

Our first treatment of this patient was to apply strips of adhesive plaster in the customary "shingle" fashion over the left side of the chest so as to completely immobilize it, and then we gave him morphin, which is a sovereign remedy for such cases. In spite of this treatment the dyspnea and cyanosis increased to such an extent within the first forty-eight hours that it was necessary to remove the adhesive strips and re-examine the chest. We found that the respiratory distress was due to a marked increase in the amount of air in the pleural cavity, but the quantity of fluid had increased but little. In order to relieve his symptoms we aspirated a large amount of air and a much smaller quantity of fluid through the sixth interspace in the axillary line with the ordinary Dieulafoy aspiration apparatus. The relief was immediate, so that the lips and finger-nails became of a reddish tinge and the dyspnea disappeared completely.

We did not reapply the adhesive plaster, but substituted for it a firm, wide muslin bandage completely encircling the chest.

This first aspiration was followed by three days of comparative comfort, but the dyspnea recurred at the end of this time, and fluoroscopic examination showed that the effusion had reaccumulated to a considerably greater extent than the air in the pleural cavity. There was less displacement of the heart and mediastinum than had been the case when the pneumothorax condition predominated. At the second aspiration we obtained about 250 c.c. of a bloody, serous fluid.

In this connection let me call attention to the fact that the term "hemothorax" is a misnomer; in many cases the condition is, in reality, a serothorax, the fluid being of a serous character rather than a bloody one, due to the response on the part of the pleura to the inflammatory reaction called forth by a trauma.

Following the second aspiration the dyspnea and other symptoms did not recur. The subcutaneous emphysema disappeared rapidly the first week after injury.

The patient from this time on made an uneventful recovery, and, as you will see from the examination today, four weeks after the injury there is practically no trace of his hemopneumothorax.

This case teaches two important things: First, the great value of the *x*-ray in the diagnosis and subsequent control of the progress of serious injuries of the chest; second, the necessity of repeated aspirations of the pleural cavity in cases of either pure hemo- or pure pneumothorax, or, as is more frequently the case, of the association of these two conditions. There are many who believe that the chest should not be aspirated unless there are symptoms of pressure in extreme displacement of the heart and other mediastinal contents. It is my opinion, however, and this is confirmed by the majority of surgeons during the present war, that one should not wait until such extreme displacement has occurred, but rather anticipate the more serious effects of the displacement due to a hemopneumothorax by aspirations of the chest at more or less regular intervals. This method of treatment assists the pleura in

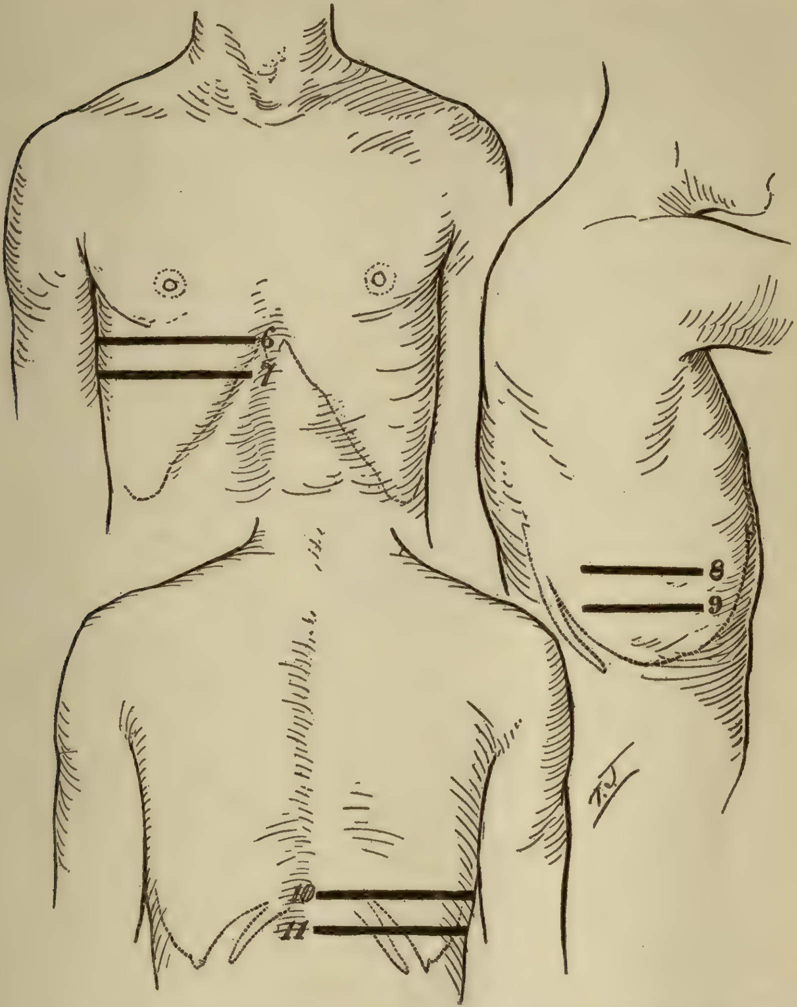


Fig. 179.—Anterior, posterior, and lateral views of thorax showing normal range of respiratory mobility of lower border of lung in the costophrenic sinus. The absence of a change in percussion-note at these levels upon deep inspiration is a very valuable sign in subphrenic abscess. (From Surgical Clinics of Chicago, Vol. I, No. 5, Oct., 1917.)

absorbing both blood and air and is becoming the standard method of treatment of such cases. The subcutaneous emphysema such as was found in this patient requires no special treatment, as the air is quickly absorbed within the first week after injury. It is only when exceptional cases such as are illustrated in Fig. 179 occur that more active operative interference must be carried out. Under these circumstances a rib which is impinging upon the lung and allows air to be pumped constantly into the subcutaneous tissues demands an immediate thoracotomy and the release of the lung in order to save the patient from the disastrous effects of a wide-spread subcutaneous emphysema, resulting in death from asphyxiation, due to the fact that the air gets into the submucous tissues of the larynx and causes occlusion of the glottis.

Summary of Case II.—Stab wound of abdomen. Kick over left side of chest followed by extreme degree of hemothorax, causing heart to be displaced to right. Multiple aspirations of bloody fluid. Recovery retarded by pleural thickening and immobility of the diaphragm. Consideration of concussion and subparietal injuries of the chest.

This patient is a boy of nineteen who entered the hospital three months ago. He had been stabbed in the left upper quadrant of the abdomen about an hour before admission, and kicked over the left axillary region. Examination of the chest failed to show any external evidences of injury and no fracture of the ribs of the injured side of the chest. On percussion an area of dulness the width of two fingers was found extending horizontally around the lower portion of the left side of the chest and there was an absence of the normal respiratory excursion of the lung into the costophrenic sinus. Under normal conditions if one percusses at the sixth rib in the mammary line, at the eighth rib in the midaxillary line, and at the tenth rib in the scapular line (Fig. 179) you will notice that the lung resonance ceases. When the patient is now asked to take a deep breath the pulmonary resonance extends down to the seventh, ninth, and eleventh ribs respectively because the lower borders of both lungs dip down into the costophrenic sinus during inspiration. The absence of this normal respiratory excursion or its replacement by dulness I have found to be one of the earliest evidences of pleural effusion, and on the right side, of subphrenic abscess.

This absence of respiratory excursion of the lung into the costophrenic sinus was very marked in our patient, but no special significance was ascribed to it at this time. Immediate exploratory laparotomy revealed the fact that the stab wound had penetrated the abdominal wall, but had not caused any visceral or diaphragmatic injury.

The postoperative course was uneventful until the fifth day, when the patient complained of great difficulty in breathing and distinct cyanosis was noticeable. There were no evidences of peritonitis, but examination of the chest showed an absence of respiratory movement and flatness with absence of the respiratory and voice sounds over the entire left side of the chest. The apex-beat was to be felt in the fifth interspace in the right parasternal line, the cardiac dulness merging with that present over the left side of the chest (Fig. 180). The patient was fluoro-

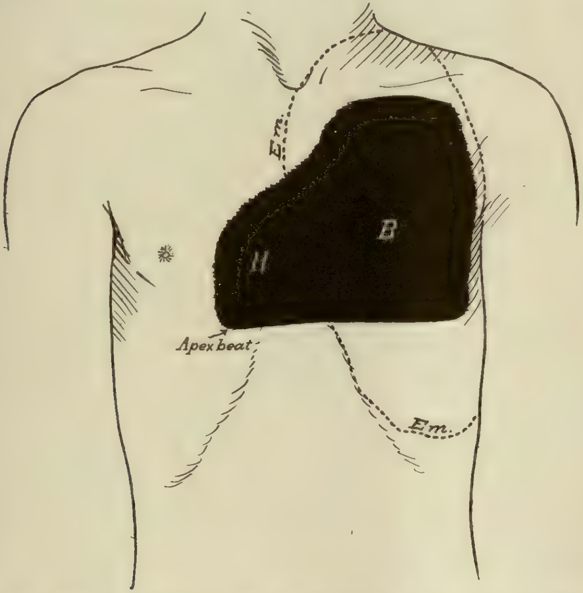


Fig. 180.—Left hemothorax with displacement of the heart to the right. *B.* Area of dulness due to left-sided hemothorax. *H.* Area of dulness behind and to right of sternum due to displaced heart. Note position of apex-beat in right parasternal line. *Em.* Median and lower limits of subcutaneous emphysema.

scoped at once and stereoscopic *x*-ray plates made. They showed a very dense and diffuse shadow over the entire left side of the chest with marked displacement of the heart to the right. On account of the density of the shadow we made a diagnosis of hemothorax and aspirated 500 c.c. of dark liquid

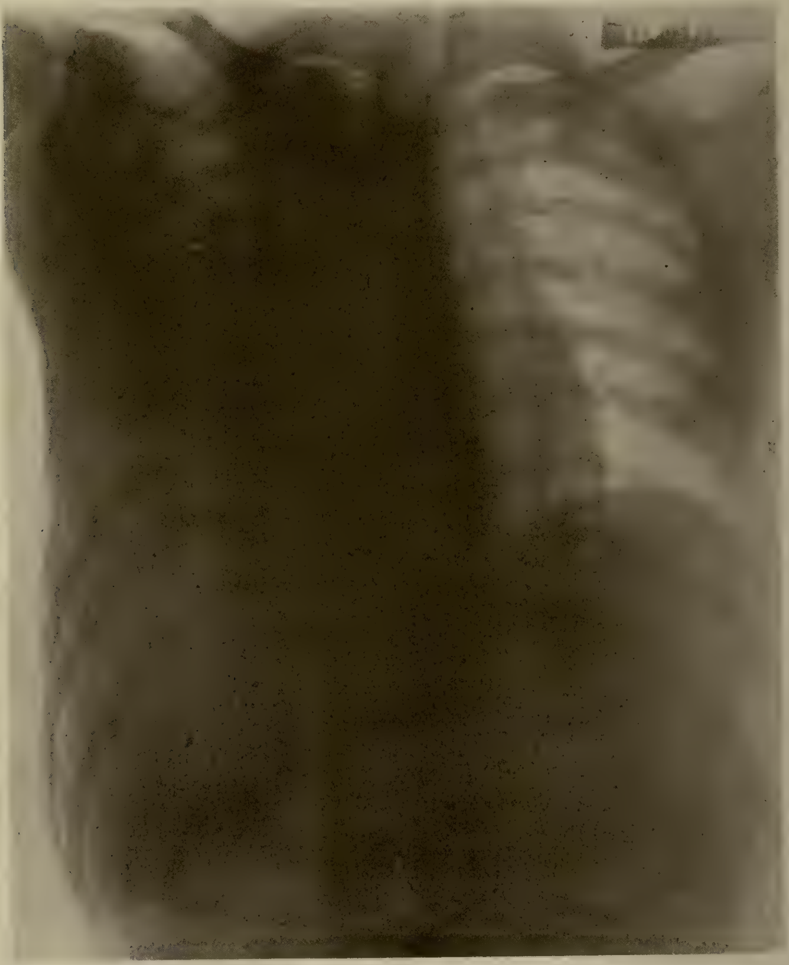


Fig. 181.—Hemothorax of left side displacing heart to the right (R. Helfer, March 17th).

blood from the left pleural cavity. This was followed by rapid improvement of the dyspnea and cyanosis, and an *x*-ray examination a few days later confirmed the return of the heart toward the left. About two weeks after this first aspiration there was a recurrence of symptoms necessitating a second aspiration of about 300 c.c. of bloody fluid. No further aspirations were necessary, but the patient continued to complain for some months of pain over the left side, and subsequent *x*-ray examinations showed some opacity due to thickening of the pleura (Fig. 181) and a very slow return to normal of the movements of the left half of the diaphragm. The expansion of the collapsed left lung was greatly aided by the employment of respiratory gymnastics, especially blowing liquid from one bottle into a second one and then back again into the first one, a method commonly used in the after-treatment of cases of empyema.

There are a number of interesting features in this case. First, there were a number of external evidences of injuries to the chest, but exploration of the abdomen had failed to reveal any wound of the diaphragm, a condition which must always be looked for in every stab or gunshot wound of the upper abdomen. The case, therefore, belongs to a class similar to the subparietal injuries of the abdominal viscera, often called injuries without external signs. In the abdomen you are all familiar with the fact that rupture of both solid and hollow viscera may follow a blow upon the abdominal wall or a crushing between cars, etc., without any evidence to be seen on the skin other than perhaps a slight abrasion or contusion. The fact that similar severe injuries can occur in the chest following a blow or crushing force is not as well known as it deserves to be, and had it not been for our knowledge of the occurrence of such injuries we would not have been able to properly interpret the dyspnea and other evidences of the hemothorax which this patient showed a few days after injury.

In this connection let me again emphasize the great value of repeated *x*-ray examinations both in civil and in war practice after injuries of the chest, and I will refer later to an article by

Pringle emphasizing this method of diagnosis in war injuries of the chest.

There is another variety of injury of the chest or, rather, of the viscera contained therein to which Koenig was the first to call attention, and it has been termed a "concussion" or "commotion of the thorax," a condition quite similar to concussion of the brain. The principal symptom is extremely rapid action of the heart with hemoptysis and dyspnea. As in the class of

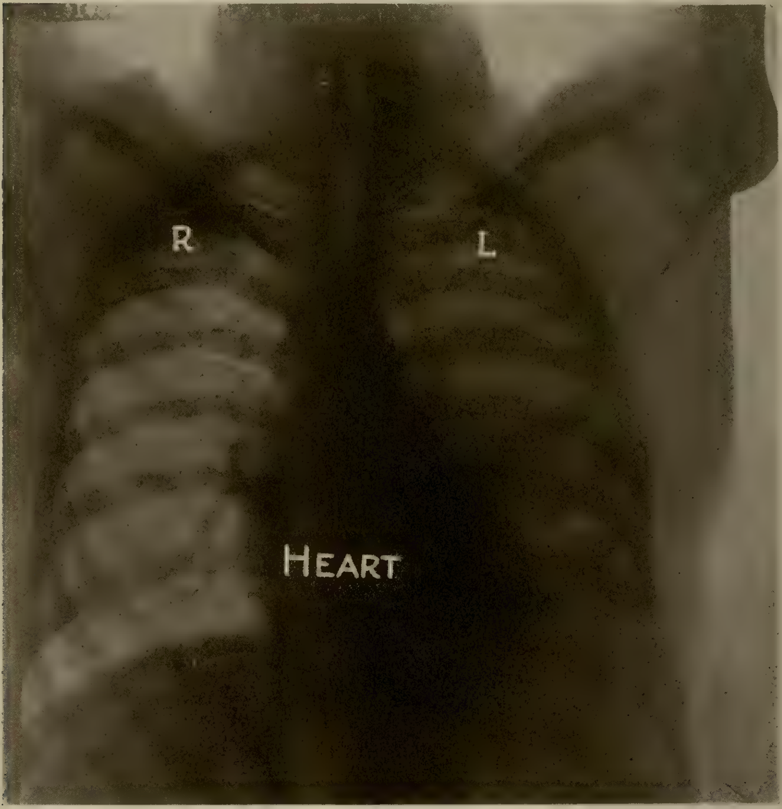


Fig. 182.—*x*-Ray print of Case I of hemothorax (left) after aspiration. Note how heart has returned to its normal position (see Fig. 181). Also observe the slight density due to thickened pleura on left side as compared with clear area on right side.

injuries of the chest to which our patient belongs, there is, similarly, no evidence of fracture or wounds of the soft parts. Effusions into the pleural cavity are not likely to accompany this condition. At autopsy the only findings are multiple punctate hemorrhages throughout the lung and on the surface of the pleura and pericardium. There is, of course, no special treatment for this condition except rest and sedatives.

In the patient whom I have just presented the abdominal stab wound remained in the background as far as clinical symptoms were concerned, and we were dealing chiefly with a non-infected hemothorax of enormous size causing displacement of the heart and other mediastinal contents (Fig. 181).

In the early months of the present war the method of treatment of such cases was guided by the previous experience in civil practice, namely, not to aspirate the hemothorax unless there were pressure symptoms. Some of the English surgeons have become more radical and advise aspiration every few days on account of the after-effects of the presence of such a large quantity of blood in the pleural cavity even if there are no signs of pressure.

Our patient of today shows the value, in my opinion, of this change in the method of treatment. A glance at an *x*-ray (Fig. 182), taken recently, about four months after injury, will show a hazy condition of the entire left side, although the heart has returned to its normal position on the left side of the chest. This haziness of the left-sided shadow is due, no doubt, in a considerable degree to the thickening of the pleura. Fluoroscopic examination has shown within the last few days that there is still a considerable lack of motion of the left side of the diaphragm, a condition which has frequently been observed by English surgeons following war injuries of the chest. The lung has apparently expanded to its fullest extent on the left side, as the percussion note over the entire chest and the respiration excursion is apparently normal in character.

Summary of Case III.—Gunshot wound of right side of chest penetrating pleural cavity, lung, diaphragm, and liver. Example of combined thoracic and abdominal injuries. Necessity of thorough examination of such cases both from thoracic and abdominal modes of approach. Tamponade of liver. Consideration of treatment of injuries of diaphragm.

I desire to present to you a third case of injury of the chest differing from the first and second non-penetrating injuries through the fact that it belongs to the class of penetrating injuries with external wound. The patient is thirty-five years of age, male, and was brought to the hospital two weeks ago after being shot by a policeman. Examination revealed the fact that there was a wound of entrance close to the spine at the lower end of the right scapula and no wound of exit. The bullet could be felt in the mammary line lying beneath the skin close to the right costal arch. The patient presented the picture of a severe internal hemorrhage, so that we felt certain of the fact that there had been a penetration of the diaphragm with injury

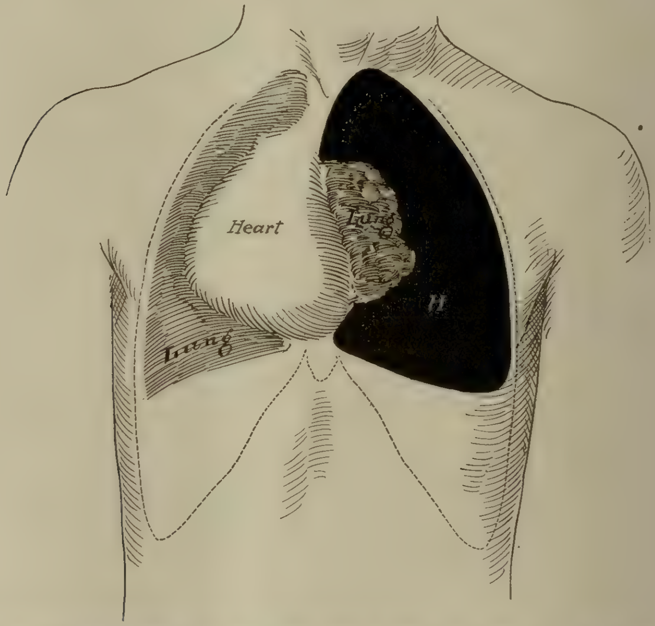


Fig. 183.—Sectional view of conditions found in Case II. *H*. Left hemothorax causing collapse of left lung and displacement of heart and mediastinum to the right.

of one of the solid abdominal viscera. The skin surrounding the thoracic wound was painted with tincture of iodin and an aseptic dressing applied, as we felt that the maximum damage had occurred in the area below the diaphragm. An incision was made over the location of the bullet and about 3 inches of the seventh rib was resected in the mammary line and the peritoneal or, rather, the subphrenic space opened. By using the rib spreader which is an indispensable instrument in thoracic operations we were able to obtain adequate exposure of an extensive bullet wound traversing (Figs. 184 and 185) the entire right lobe of the liver from its convexity to a point close to the lower border

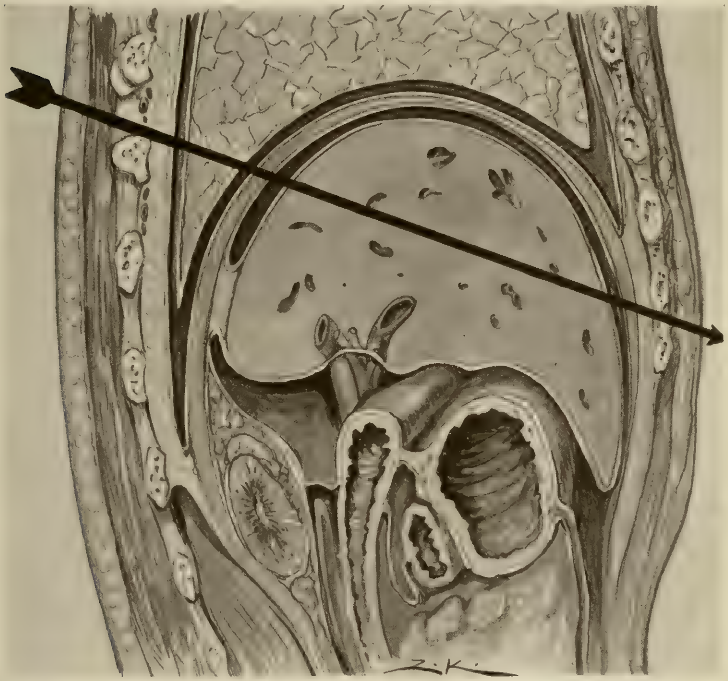


Fig. 184.—Sagittal section showing course of bullet in Case II. The arrow indicates the manner in which bullet entered posterior portion of chest between sixth and seventh ribs, penetrated the pleural cavity, lung, diaphragm, liver, and anterior abdominal wall, and was found close to skin just above right costal arch in mammary line.

of the right lobe. The abdominal cavity contained a large quantity of blood and there was still free bleeding from the track of the missile. Suturing the liver substance under these conditions, even by the use of mattress sutures, is not practicable, inasmuch as the liver tissue is so brittle that such sutures will not hold. Hence we were obliged to resort to firm packing of the wound in the liver with gauze. You can form a conception of the extent of the wound in the liver when I tell you that it required 25 yards of gauze (1 yard wide, but folded) to control the hemorrhage. I can warmly recommend packing liver wounds, and believe that no time should be lost in attempting a suture of such cases.

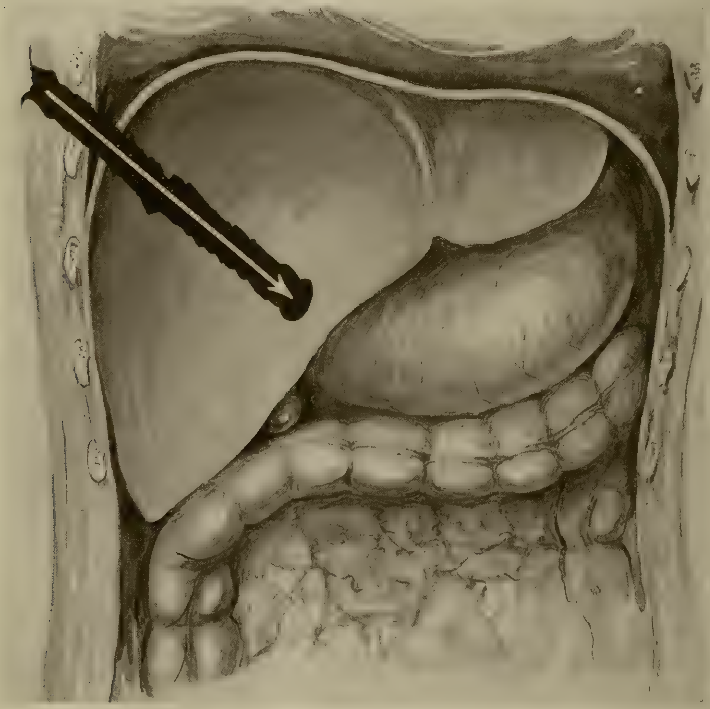


Fig. 185.—Anterior view indicating course of bullet in Case II. Note ragged character of wound along course of projectile.

We did not have time to examine the condition of the diaphragm further than to see that it was extensively lacerated, but owing to the condition of the patient were not able to suture it.

The gauze packing was removed at the end of five days and a slight secondary hemorrhage required a repacking of the wound. His anemia has almost completely disappeared and his wound now appears clean. Nearly all of the gauze packing has been removed and recovery seems almost certain.

This case emphasizes the necessity of a thorough examination of combined thoracic and abdominal injuries. This is true both in the case of simple penetrating injuries as we encounter them in civil practice as well as of more extensive shell wound injuries as they are met with during the present war.

I shall speak later of the more radical procedures advocated by both French and English surgeons in the treatment of such combined thoracic and abdominal injuries, especially of the repair of the laceration of the diaphragm and the conversion of an open pneumothorax into a closed pneumothorax. It may be said at this time that of the two methods of approach for abdominal injuries which complicate thoracic injuries, one should never attempt to do more than investigate and treat the injury of the diaphragm or possibly of the liver from the thoracic side. The preferable method of approach for abdominal injuries should be the same as exists for the abdominal injuries of civil practice, viz., one of the abdominal incisions. Let this case, therefore, be a warning to watch every case of penetrating injury of the thorax carefully for evidences of abdominal injuries so that valuable time will not be lost in making a diagnosis of injury to a solid or hollow abdominal viscus.

Summary of Case IV.—Stab wound of upper lobe of left lung. Diagnosis of penetration of lung made by presence of external subcutaneous emphysema over entire left side of chest.

This patient presents no unusual features except the presence of a wide-spread subcutaneous emphysema extending from the lateral regions of the neck above almost to the costal arch below, over the entire left side of the chest. He was stabbed last evening in the supraclavicular region, *i. e.*, over the apex of the left lung. The chief question which arose was whether the wound had penetrated the chest wall and injured the lung also. There were no evidences of severing of the nerves or blood-vessels at this portion of the neck. The presence of the wide-spread emphysema is a positive evidence of a penetration of the lung, although no other symptoms, such as hemothorax or pneumothorax, are present. I am simply showing him in order to call your attention to the great value of symptoms, such as hemoptysis, subcutaneous emphysema, hemothorax and pneumothorax, or pressure symptoms of intrathoracic injury. The patient will be carefully watched to see if any infections develop within the soft tissues or within the pleural cavity, and he will be frequently fluoroscoped in order to watch for effusion within the pleural cavity. In other words, the treatment of such cases is one of watchful expectancy, the chief methods of control being the temperature and frequent *x*-ray examinations.

Summary of Case V.—Stab wound of right side of chest with extensive serohemothorax and fever. Consideration of cases of fever following injuries of the chest, special attention being directed to the fact that fever may be present even though the effusion be not infected.

This patient is a man thirty years of age, who entered my service about three months ago with a stab wound of the right side of the chest, the wound of entry being in the fifth interspace in the midaxillary line. Examination within a few days after the injury revealed the presence of an extensive effusion within the right pleural cavity with displacement of the lung toward the left, but with no marked signs of pressure, such as dyspnea or cyanosis, as would occur with a left-sided effusion to the same degree. At the time the patient entered we were not in the habit of aspirating such cases as a routine measure, which is our custom at the present time, influenced, as I have stated before, by the experience of surgeons in the present war.

The case presented no unusual features until about two weeks after the injury, when he began to have elevation of temperature to 102° to 103° F. We made exploratory puncture on several occasions and obtained a thin, serous, bloody fluid, but cultures revealed the sterile nature of the fluid.

Fever persisted in this case for nearly two months, and we felt certain at times that we were dealing with an infected hemothorax, but cultures made from fluid obtained by exploratory puncture showed the effusion to be sterile. Several of the English surgeons have called attention to this persistent rise of temperature in cases of non-infected hemothorax following war injuries, and I shall refer to this later. This case shows the necessity of making careful bacteriologic examination of the fluid obtained by aspiration or exploratory puncture in cases of hemothorax when fever is present.

Observations of chest wounds during the present war has taught us much in regard to methods of diagnosis and treatment. Under the head of diagnosis the value of early *x*-ray examination and the control of the progress of the case by repeated fluoroscopic examinations has revolutionized all other methods. Our views in regard to treatment of chest wounds have undergone radical changes as the result of the experience of the past four years. I refer especially to the following subdivisions of the subject:

1. The treatment of combined abdominal and thoracic injuries.
2. The treatment of non-infected and infected closed hemothorax.
3. The treatment of open pneumothorax, an injury scarcely known before the use of explosive shells.
4. The question of removal of projectiles.

Great care has been taken to observe the combination of thoracic and abdominal injuries, advantage being taken of the experience of civil practice in cases similar to the one I have shown you today (Case III). The frequency of these combined injuries makes it necessary to keep in mind constantly the possibility of a perforation of one of the solid or hollow abdominal viscera in every case in which the wound of entrance is above the diaphragm. Injuries of the latter are, of course, readily recognized when the wound of entrance is quite large, as in the case in an open pneumothorax (see Fig. 188). In such an injury the preferable method of treating the wound in the diaphragm is through the thoracic opening. In all other cases, where the wound of entrance is small in the thorax and observation of the case renders it probable that a perforation below the diaphragm has occurred, it is best to perform a laparotomy at the earliest possible moment and deal with the injury to the diaphragm

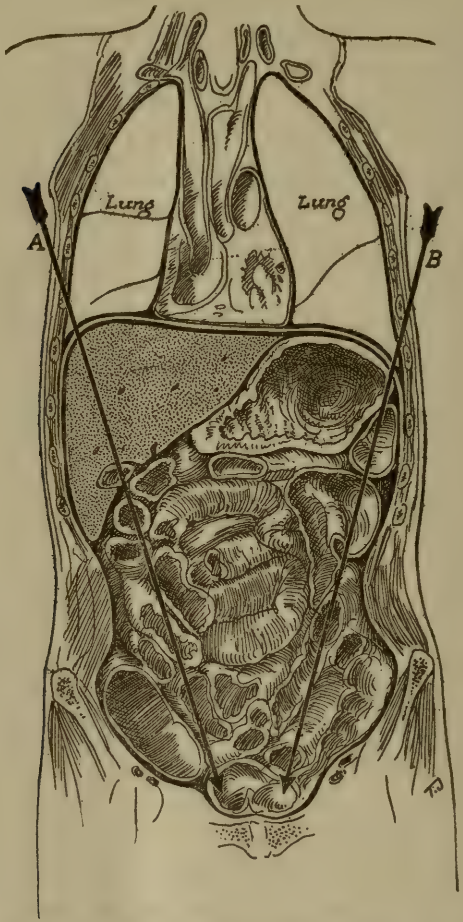


Fig. 186.—Combined thoracic and abdominal injuries. The arrow on the right side indicates the course of a projectile which first traverses the pleural cavity and lung and then penetrates the diaphragm and liver, and from these, in some cases, further into the hollow viscera of the abdomen. On the left the course is similar, but the projectile often penetrates the stomach or spleen.

from below rather than to enlarge the thoracic opening. A glance at Fig. 186 will show you the close relationship of the structures above and below the diaphragm, and the present war has shown the necessity of most vigilant observation of all thoracic injuries for indications of abdominal mischief.

The treatment of non-infected hemothorax during the early months of the present war differed but little from that which, as in Case II shown you today, was our custom for many years in civil life. This practice has been to abstain from any interference with a hemothorax as long as there were no evidences of infection or of pressure upon the heart and mediastinum. This expectant method has been gradually replaced by more active interference even in the non-infected cases. In the absence of symptoms of displacement of the heart, etc., it is at the present time considered perfectly justifiable and, in fact, indicated to aspirate at as early a period as possible after receipt of the injury, and to repeat the aspiration at intervals of three to five days, controlling this procedure by repeated *x*-ray examination. In this connection let me remind you again of the fact that, as in Case V, fever may be present in a non-infected hemothorax for weeks and yet cultures of the fluid obtained by aspiration show no growth. This fever is undoubtedly the result of absorption and in some cases may lead to more radical methods not called for by the case, if it had been known to be sterile.

The treatment of infected cases of closed hemothorax has also undergone many changes. Thoracotomy is indicated at a comparatively early period in the history of such cases, but the prolonged suppuration following free drainage of the infected blood within the pleural cavity has led to many efforts at primary sterilization. Depage and Tuffier have been the pioneers in this effort. Shortly after an infected hemothorax has been drained, solutions, such as Carrel-Dakin, are instilled at regular intervals with the object of converting the infected pleural cavity into a sterile wound cavity. Whenever cultures show this to be the case the drainage-tube is removed and the wound in the thoracic wall closed. Both English and French surgeons strongly recommend this method in an effort to cut short the exhaustion and other sequelæ of the prolonged suppuration so frequently found in these cases of infected hemothorax. The tendency in general, both in non-infected and infected closed hemothorax cases, has been toward more radical procedures and the application to this field of the valuable experience secured in the primary sterilization of wounds of the extremities by the Carrel-Dakin and similar methods.

What seems to me a most excellent way of treating these cases of septic hemothorax is that given by Campbell[1] in a recent article. He states that many cases of septic hemothorax in the early stage can be successfully treated by thoracotomy and careful removal of all fluid and clot, followed by washing out with Dakin's solution and complete closure of the pleural cavity. This treatment, however, is of no avail in half of the severe septic cases, and drainage is followed by long-continued fever and exhausting suppuration. He has found in a number of cases that his method is superior to any other for the severely septic cases. An *x*-ray examination is first made and any foreign body localized. Under a general anesthetic the wound is explored, the fractured portions of rib resected, and the wound sewn up if its condition allows. The pleural cavity is then drained in the usual fashion, resecting about 3½ inches of rib as far forward and as low as possible, that is, usually the eighth rib in the mid- or anterior axillary line. Through this opening the cavity is explored, and an easily accessible foreign body and fragments of loose bone lying in the cavity or on the surface of the lung removed. Blood-clot and fibrin are swabbed out as far as possible, and any septa forming loculi broken down. The cavity is next washed out with a warm mixture of hydrogen peroxid and eusol, or Dakin's solution. A rubber tube of ¼-inch internal diameter, with a large lateral opening ¼ inch from one extremity, is then inserted, so that this end lies in the most dependent part of the pleural cavity when the patient is lying on the *normal* side, that is, in the costovertebral recess behind the pericardium. Finally, the wound is loosely sewn up, but no attempt is made to effect an air-tight closure around the tube.

[1] Brit. Med. Jour., January 26, 1918, p. 109.

When the patient has recovered from the operation the size of the cavity is estimated by filling it carefully (but usually incompletely) with warmed Dakin's solution, and then emptying it. After this the cavity is filled through the tube every four hours to about one-third of its capacity or less with Dakin's solution. At the end of two hours another long tube is attached to the tube in the chest and the fluid siphoned out, the patient meanwhile lying on the sound side with the chest opening uppermost, or as nearly so as possible. The patient is told to pant or cough slightly at frequent intervals as long as the fluid remains in the chest, and by this means splash the fluid about inside the cavity, and so bathe with it the entire infected surface and any recesses that may exist. In this way the pleural cavity contains for two hours a large quantity of sodium hypochlorite solution and is more or less empty for a like time. During the former period the patient lies rigidly on the sound side, without any raising of the shoulders to prevent escape of the fluid and consequent flooding of the bed; during the latter

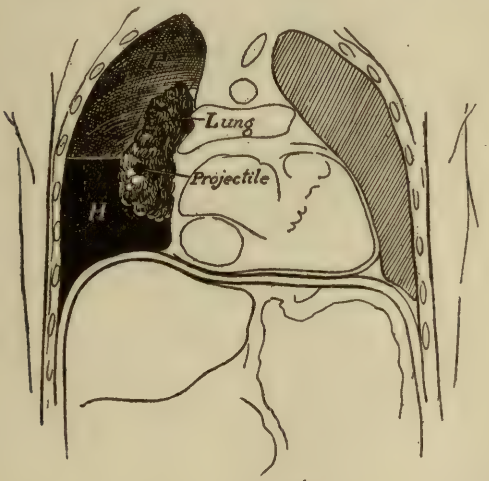


Fig. 187.—Right closed hemopneumothorax with projectile in lung. *H*. Hemothorax only partially filling the right pleural cavity. *P*. Pneumothorax (closed) above the collection of blood in the right pleural cavity. Note collapsed right lung and position of projectile (dark area) in lung.

he is free to lie as he chooses. Thus the patient gets a reasonable amount of rest and comfort and is saved the exhaustion associated with the maintenance of one constant position. In addition, once daily the tube is removed, sterilized, and replaced, and the cavity washed out, as in the usual treatment for empyema. To overcome the disadvantage of injecting cold fluid into the chest, the author has found that it is better to make the Dakin's solution of double strength and, prior to filling, to dilute it with an equal quantity of warm sterile water.

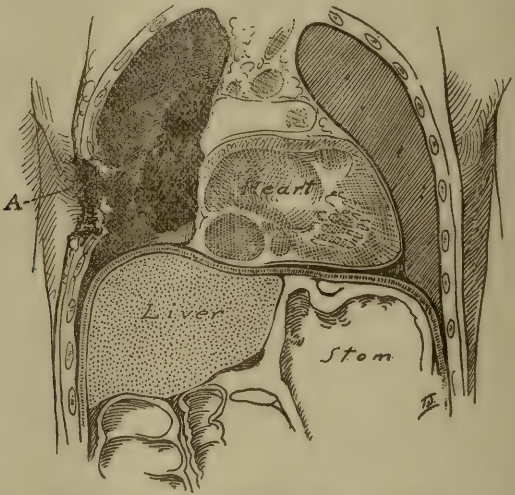


Fig. 188.—Open or "sucking" pneumothorax in a case of shell wound of the right side of the thorax. Note extensive destruction of soft tissues at point of entrance of the explosive shell and the rib fragments projecting into pleural cavity. Note also the collapse of the right lung. Many such severe injuries are complicated by (*a*) collapse of the opposite ling, (*b*) extensive injury of the diaphragm and abdominal viscera.

In the early months of the war the mortality from injuries of the chest due to the action of explosive shells was appalling. The resultant open or leaking pneumothorax (Fig. 188) was not actively treated until the latter half of 1916, when both French and English surgeons began to advocate early closure at the casualty clearing stations. Operation is especially indicated in these cases if (*a*) one suspects an injury of the diaphragm, (*b*) when an open pneumothorax (Fig. 188) exists, (*c*) where a large missile has traversed the pleural cavity, whether lodged in the chest wall, lung, mediastinum, or pericardium (Fig. 189). The ragged soft parts must be first excised, then all loose fragments of bone and foreign bodies, if larger than a filbert, removed, then the pleura and muscles are sutured and the open pneumothorax converted into a closed one. In about 50 per cent. of the cases no infection follows, but if it does, the wound can be readily reopened and the case treated like one of infected hemothorax.

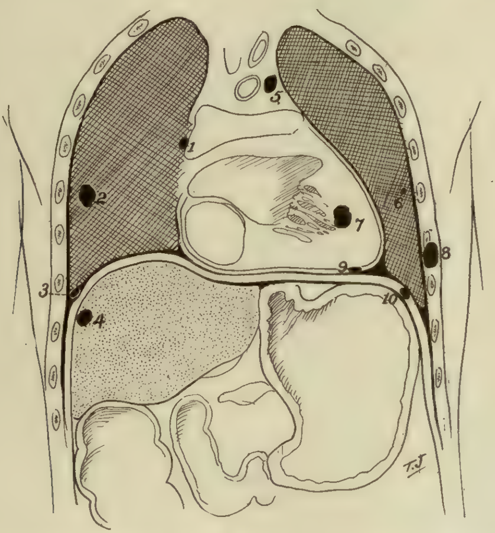


Fig. 189.—Various locations of projectiles in the thoracic viscera. 1. Deep in hilus of lung. 2. Large projectile in parenchyma of lung. 3. Free in pleural cavity. 4. Near convexity of liver. 5. In mediastinum. 6. Small projectile just beneath pleura. 7. In wall of left ventricle. 8. In thoracic wall. 9. In pericardium. 10. In diaphragm.

The question of the removal of projectiles is one which is far from being settled. Many of the French surgeons, like Duval, Villeon, and others, believe that all projectiles, no matter how small they are, should be removed. Other surgeons take the stand that only those of larger size require removal, the remainder will become encapsulated and never give rise to further trouble. Duval has suggested a method which is quite extensively employed at the present time. The projectile is first localized by the Hirtz compass and a rib resected over the area. The lung is then brought into the opening (Fig. 190) and held by a Collin forceps and an incision made over the projectile. As a rule, no sutures are necessary for the lung.

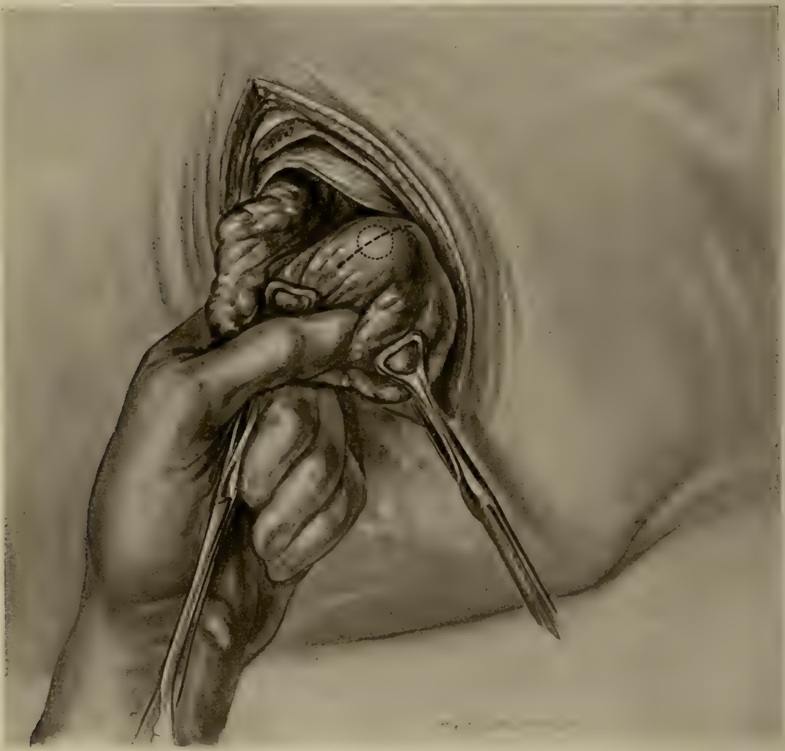


Fig. 190.—Removal of projectile from the lung (Duval). Note how lung is pulled out into opening in thoracic cavity and is held firmly by special forceps while an incision (dotted line) is made over the projectile.

The subject of war injuries of the thorax is one which is receiving such active consideration at the present time that a knowledge of the rapid advances made during the present war is most essential to the surgeon both in civil and military life.

CLINIC OF DR. E. W. RYERSON

Chicago Policlinic Hospital

BUNIONS

Summary: Cause of bunions—the guilty shoe; mechanics of bunion production; palliative treatment; the Mayo operation—its disadvantages; technic in present case—expected results.

This woman's life has been made miserable for the last ten years by two large bunions. She was told a short time ago that an operation would relieve her, and she at once consented to have it performed.

This deformity was caused solely by an improperly shaped shoe which pushed the big toe out of line and crowded it over toward the smaller toes. The heel of the shoe was too high, and the foot slid downhill into the front of the shoe, which was shaped like a funnel and not like a foot. The front of the shoe was neither broad enough nor long enough to allow the toes sufficient room, and the pressure upon the big toe forced it diagonally backward against the head of the metatarsal bone. This pushed the metatarsal out of line, inward, toward the other foot, increasing abnormally the space between the first and second metatarsal ends, as is well shown in the x-ray picture (Fig. 191).

The continued pressure of the metatarsal head against the side of the shoe caused a protective thickening of the overlying skin, and it became painful and calloused. The fourth and fifth toes also suffered from too much pressure, and corns developed upon them. The patient purchased some wider shoes, wider across the ball of the foot, but just as pointed and funnel shaped at the toe, and the additional width over the ball allowed the metatarsal head to be pushed still farther out of place. By this time the big toe was so far out of position that its proximal phalanx articulated only with the extreme outer portion of the metatarsal head. The pressure and friction over the bunion caused a bursa to form between the skin and the metatarsal head, and at intervals the bursa became irritated and inflamed, and sometimes suppurated.

In some of the early text-books on surgery this bursa was considered to be the actual bunion, and its removal by operation was recommended as a curative procedure. It should be recognized that the bursa is only the result of the hallux valgus, and is simply a protective and defensive reaction against abnormal pressure.

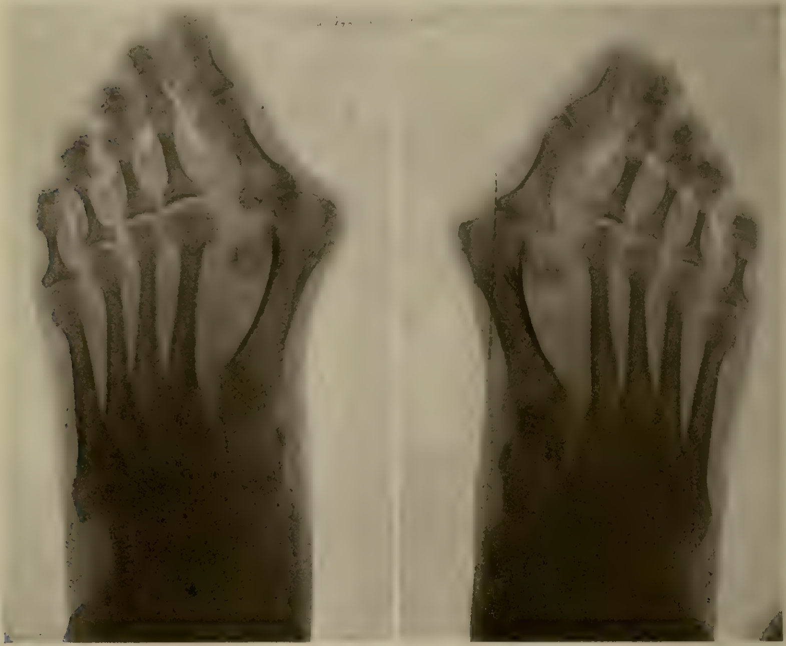


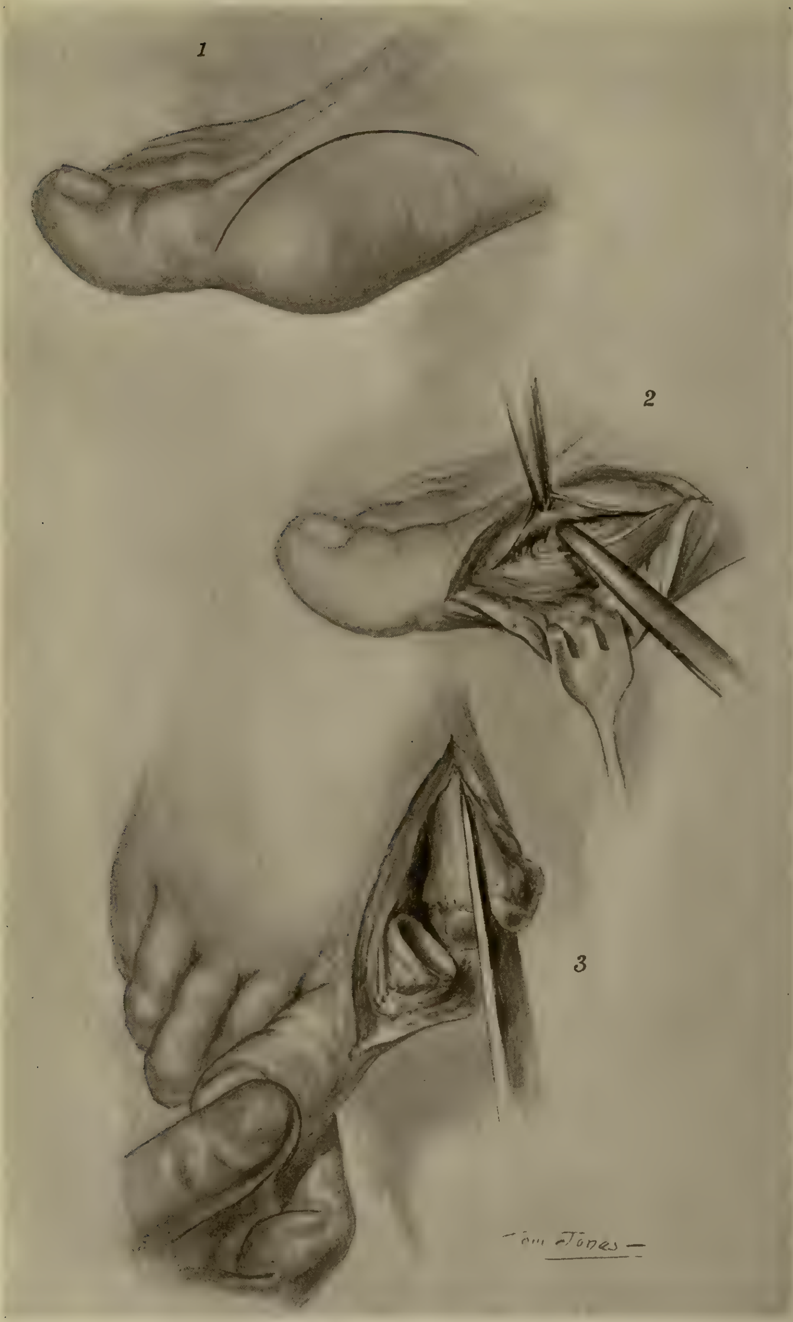
Fig. 191.—*x*-Ray showing typical deformity in case of bunions. Dotted line indicates site and direction of incision with osteotome in the curative operation.

The patient has experimented with various forms of conservative treatment for several years. A rubber cover was made by a chiropodist to fit over the painful area. This gave slight relief from the friction, but macerated the skin. Pads were applied between the toes, to force the big toe inward, toward the other foot, but there was not room enough in the shoe for a straight toe, and the pads and toe-posts simply caused increased pain. Of late the toe has become fixed in its valgus position, and cannot be straightened by muscular action or manual force.

Now, what can be done to give relief in a case of this kind? If conservative treatment alone were to be used, it would require about two years of constant work to make the feet comfortable, and at the end of this time there would still remain considerable deformity on account of the thickening of the head of the metatarsal bone and of the tissues which cover it.

It will save much time to the patient and the end-result will be much more satisfactory if an operation can be performed which will relieve the pain and remove the deformity. Several operations have been popularized, of which the most widely practised is the removal of the entire distal end of the metatarsal bone, as advised by Hamilton, Heubach, and many others. This operation has certain disadvantages. It is very rarely necessary, except in extreme cases where the toe is so displaced as to lie transversely across the foot. It removes an important point of support from the distal end of the arch, so that flat-foot is certain to be caused. It requires a long period of convalescence. It sometimes causes ankylosis of the joint, which is very disabling. I very rarely feel obliged to resort to this operation. Every surgeon who operates upon bunions should realize that no single method of operation will suffice for all varieties of cases, and that the less mutilating operations should be used whenever the indications will warrant them. It is as unnecessary to excise the entire head of the metatarsal for the *average* painful bunion as it would be to amputate the leg for the average painful corn.

A more useful operation is that described by C. H. Mayo, in which the distal end of the metatarsal head is removed on a slant, so as to allow the phalanx to come easily into the straight line. The projecting inner side of the head is also removed by a longitudinal cut, and the bursa is sutured over the end of the metatarsal to prevent ankylosis. This operation has been widely practised, and seems to have given satisfaction to most observers when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properly performed. It is unnecessarily severe in cases of moderate bunion, and the results are not always good as regards the mobility of the toe. I have examined a number of patients who had been operated upon by the Mayo technic. In some of them the joint was painful and of limited motion. The articular end of the metatarsal had been cut in the usual slightly oblique manner, which had left a flattened joint surface, and there was a distinct lack of smoothness in the flexion and extension of the toe, amounting to a perceptible jerk as the phalanx was moved over the end of the metatarsal. If you will examine this articulation in a normal specimen you cannot fail to be struck with the extremely workmanlike smoothness and roundness of the end of the metatarsal. It has to be smooth and mathematically round in order to allow the phalanx to glide over it easily. If now we cut a good-sized section flat off from this round head we must not be surprised if the joint does not functionate in a normal manner. In the few cases a year where I perform the Mayo operation I carefully round off the end of the bone with an ordinary rasp in order to avoid the irregular mobility. Mechanically, as well as technically, it is easier and better to excise the base of the first phalanx of the toe than to interfere with the articular surface of the metatarsal head.

Another objection to the Mayo operation is that too little attention is paid to the part of the bone which is really the cause of all of the pain. It is not the articular surface which gives the trouble, but the inner side of the metatarsal head. This is what projects inward and becomes pressed upon by the shoe. If we remove a long, thick section from this part of the bone we at once remove the chief deformity, and the exciting cause of the discomfort. We do not, it is true, repair entirely the intrinsic hallux valgus, the outward deviation of the big toe and the inward deviation of the metatarsal, but we relieve the patient of the pain and disability. The chief value of the Mayo operation, then, is that it removes the bursa, straightens the toe, and shortens the

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Fig. 192.—1. Skin incision. 2. Elevating the periosteum. The bursa has been excised completely. 3. Removal of the portion of the bone which is causing the trouble.

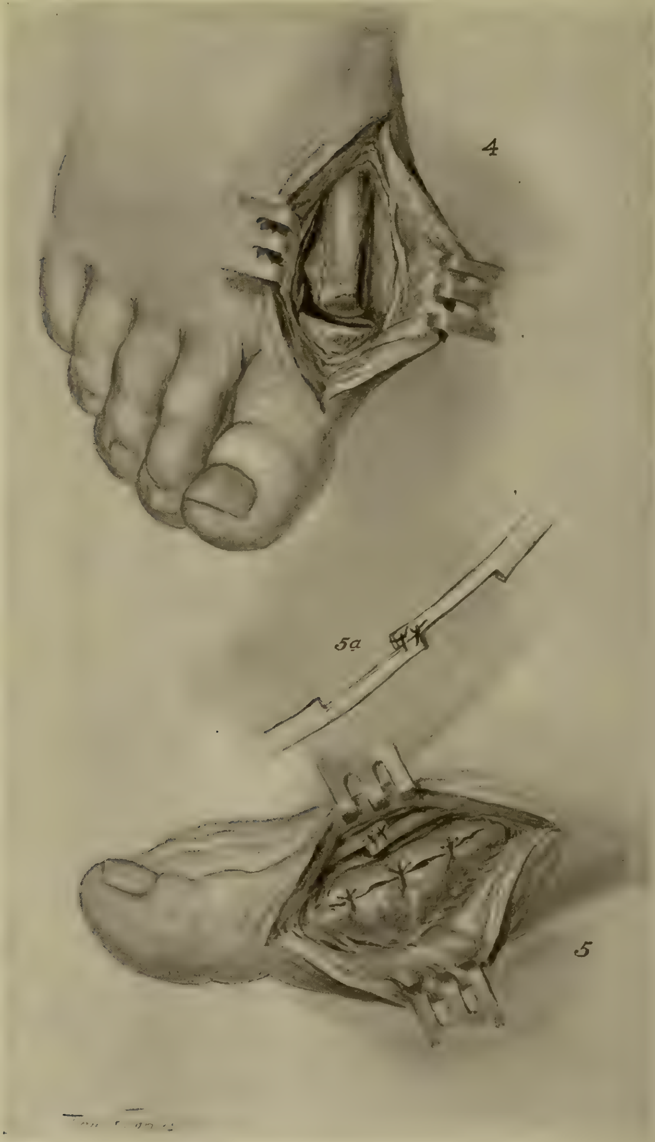

Fig. 193.—4. The sharp edges of the bone have been smoothed off with a coarse file. The joint is ready for closure. 5, *a*. Method of lengthening the extensor proprius hallucis tendon. 5. Tendon lengthened. Periosteum sutured loosely.

toe. Now, the bursa is by no means always present in even very severe and painful cases of hallux valgus. When it is present, it can easily be removed *in toto*. The straightening of the toe is not always desirable, since, first, a moderate deviation of the toe is not of very great consequence, provided the shoe be long enough; second, it is very difficult in many parts of our country for women (and often men) to obtain shoes which will allow the toe to remain straight, and, third, it is impossible to persuade the average woman to wear a straight shoe when it can be obtained. What most women desire is to be enabled to wear comfortably a shoe resembling other women's shoes. The shortening of the big toe is entirely unnecessary in most instances, but if it be judged necessary in individual cases it can be done much more logically by shortening the phalanx than by shortening the metatarsal bone.

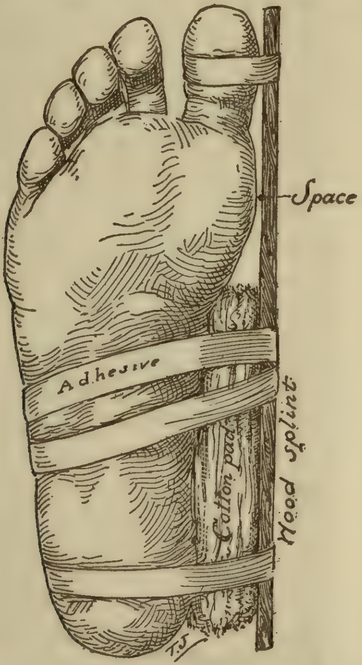

Fig. 194.—Method of holding toe in corrected position. Note space between incision and splint. Splint must not press against skin.

It will be seen, then, that I do not believe that any single type of operation is suitable for all cases of bunion; that I think many cases are subjected to unnecessarily severe and mutilating operations without sufficient indication; and that I think the operation about to be described is suitable for the large majority of cases of bunion. These beliefs are founded upon the observation of a large number of cases upon which I have operated, and a small number of cases which I have examined and treated after they had been operated upon by other surgeons. It is fair to state also that many of the patients upon whom I have operated are residents of Chicago, and can undoubtedly be produced in evidence of the truth of my statements.

The operation which I have found most frequently indicated is in no way original except perhaps in trivial details. It is essentially that described by Schede, and redescribed by Reichel, Wilson, Porter, and others. It does no damage to the joint or the arch, and it enables the patient to wear reasonably fashionable shoes without pain after a speedy convalescence.

A curved incision with the convexity upward is made from the middle of the proximal phalanx backward along the side of the metatarsal bone. It should be about 2½ inches long. The skin-flap is turned downward, and if a bursa be present it is dissected out and thrown away. A longitudinal cut is made in the fascia and periosteum, and the periosteum peeled back from the metatarsal bone so that the inner half of the head and part of the shaft are exposed. The capsule of the joint is cut and the toe pushed outward so that the articular surface is clearly seen. A sharp, broad, thin osteotome is now placed at the middle of the joint surface, pointing backward toward the heel, and the whole inner side of the head with part of the shaft is split off obliquely toward the base of the metatarsal. The section removed will ordinarily measure an inch or more in length by $\frac{1}{4}$ to $\frac{3}{8}$ inch in thickness. The cut surface of the bone is carefully smoothed off and rounded with the chisel and flat file, and all chips and splinters are removed. In this particular case there is also an exostosis on the upper surface of the metatarsal head, which is cut off with the chisel.

The toe can now be straightened, but the tendons of the extensor proprius and extensor brevis hallucis are resisting rather strongly. The brevis is, therefore, cut in two, and the proprius is lengthened by splitting and suturing.

The periosteum is now brought over the denuded bone and sutured with catgut. The skin is united with waxed silk and the line of incision smeared with sterile vaselin to allow the bleeding from the bone to find an easy exit. In some cases where the bleeding is unusually free a catgut drain is inserted, to be removed in twenty-four hours. A dry sterile dressing is applied.

The same operation is done upon the other foot, except that a deep callus overlying the bunion is excised. A small pad of gauze is placed between the toes to hold the big toe reasonably straight. If it were desired to make the toe perfectly straight a light wooden splint would be applied over a thick pad of cotton fastened to the posterior half of the foot, and the toe fastened to it with a strip of adhesive plaster.

In ten days the sutures are removed if the wound is strongly healed, and in a day or two more the patient is allowed to walk about on the heels, wearing bedroom slippers.

It is admitted that this operation may not, in very severe cases, sufficiently correct the deviation of the toes, but it is surprising to see how few cases will need to have any of the articular surface removed if the surgeon will first perform the operation I have described. Then, if articular surface must be removed, remove it from the phalanx and not the metatarsal head.

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TREATMENT OF POTENTIAL AND ACQUIRED STATIC FLAT-FOOT

Summary: The four fundamental types of flat-foot; their clinical and anatomic characteristics; potential and acquired static flat-foot; etiology—the importance of ill-fitting shoes; signs and symptoms as related to the advancing pathology in progressive cases; differential diagnosis; treatment—prophylactic and curative—the "strapping" method.

In order to secure the desired end-result in the treatment of flat-foot in the largest possible percentage of cases there are certain fundamental principles which should be thoroughly comprehended and kept constantly in mind by the physician applying the treatment. The first one of these is the fact that there are four fundamentally different types of flat-foot, and, because of the fact that the method of treatment which is very beneficial for one type may be valueless in the other, it is of great importance to make an accurate differential diagnosis before a line of treatment is decided upon and instituted. The four types of flat-foot are congenital, traumatic, paralytic, and static, and the latter is again subdivided into potential and acquired.

Congenital flat-foot is very often not a true flat-foot at all, as the arch of the bony structure of the foot may be perfectly normal and the space under the arch of the foot simply filled in by a cushion of fat. This type of flat-foot very often causes no symptoms and, in that event, does not incapacitate the patient. The fact that the patient has always had a flat-foot can usually be ascertained from the history, and helps in making a differential diagnosis. If the history is indefinite, a stereoptican *x*-ray is of great help. There is never any spasticity of the muscles in a simple congenital flat-foot. The foot has a peculiar pudgy apperance as a rule.

Traumatic flat-foot, as the term implies, always follows a traumatism, evidence of which is usually found on inspection or can be elicited in the case history. Every case of traumatic flat-foot is a problem in itself, and no routine treatment can be outlined because the location, nature, and extent of the injury and deformity must determine the treatment to be followed.

Paralytic flat-foot often follows infantile paralysis, and its diagnosis is usually the diagnosis of infantile paralysis.

Flat-foot is much more common than is generally supposed. In Munson's work we find the statement that of 9901 members of the Illinois Guard, who offered themselves for the United States service in 1898, 33, or $3\frac{3}{10}$ per thousand, were rejected because of excessive or painful flat-foot. All of these had previously passed the physical examination required to enter the State Militia. How many were rejected during this first examination is not stated, nor is there any record of how many of the remaining 9868 suffered to a minor degree from this condition. From the Surgeon General's Office I was able to obtain the following statistics: During the years 1903, 1904, and 1905 132,145 men were examined for the United States army. Of this number, 457, or $3\frac{4}{10}$ per thousand, were rejected because of excessive flat-foot. These figures include all men who were examined for re-enlistment and does not take account of those suffering from flat-foot who were rejected for some major trouble. For instance, an applicant suffering from hernia and flat-foot was, of course, rejected, but the cause of his rejection was given as hernia. From these statistics, one would be justified in concluding that out of every 10,000 men at least 33 are suffering from flat-foot to a degree which makes them undesirable for military service. I am inclined, however, to believe that these figures are somewhat too low, because, as a rule, only reasonably able-bodied men apply for enlistment. When the present war is over we may be able to settle this question more definitely because a very much larger number of men will have been carefully examined by that time, and those examined will more nearly represent the average citizen than in any previous examination.

The balance of this discussion will be devoted to a consideration of the two forms of static flat-foot, potential and acquired.

Etiology.—Whenever a disproportion occurs between the strength of the foot and the strain to which it is exposed, flat-foot is likely to develop; in other words, anything which weakens the foot or exposes it to excessive strain predisposes to the production of this condition. The strength of the foot may have been impaired from birth, may have become impaired through systemic disease, or, what is much more likely, may have become relatively weak at the time of puberty. The careful study of the histories of many flat-foot patients reveals the fact that the great majority of them refer the first occurrence of flat-foot pains back to this period in life. The disproportion which exists at this time between the weight of the body and the strength of the muscles is unquestionably one of the most common causes of flat-foot, but anything which weakens the general musculature, such as severe systemic disease, or which in any way impairs the strength of the tibialis anticus and posticus muscles in particular, has the same tendency. The excessive strain may be caused by anything which increases the weight of the body or the load that is to be born by the arch; thus, for instance, obesity with the lack of sufficient exercise to keep the musculature in good tone is not an uncommon cause of flat-foot; excessive burden bearing, particularly during the period of adolescence, is also a common cause; long-continued standing when tired, particularly when the patient has gotten into the habit of assuming the "attitude of rest," so well described by Annandale, is very prone to cause flat-foot, because this attitude places the supporting muscles at a great mechanical disadvantage and thus increases the strain to which the ligaments are exposed.

Ill-fitting shoes are another common cause of flat-foot. Many of the ready-to-wear shoes are too low over the instep, and as a result many a person, who starts out in life with splendid arches, develops flat-foot in the course of years, because his shoes are constantly exerting pressure over the arches, forcing the foot into abduction and eversion, thus putting them at a mechanical disadvantage. This is much more readily understood if we recall the rule in physics which states that "action and reaction are always equal and in opposite direction," and also if we study Fig. 195 carefully, which is the actual outline of a foot and the actual outline of the corresponding shoe which had been worn on this foot for a considerable time. This illustrates clearly that, when this shoe is placed on the foot, pressure has a tendency to eventually break down the arch and to force the foot into eversion (Fig. 196). One proof of this latter effect is found in the fact that many patients, who have unusually high insteps, have corns on the outer surface of their little toes, because these surfaces of the feet are constantly being pressed against the inner surface of the shoes. As long as the faulty shoe is worn, nothing will permanently relieve the corns, but, as soon as a suitable shoe is substituted, the corns can easily be cured. A further proof of the harmful effect of a shoe that is too low over the instep is the fact that potential flat-foot pains are, if anything, more common among persons who start out in life with a high instep than among those who start with a low one.

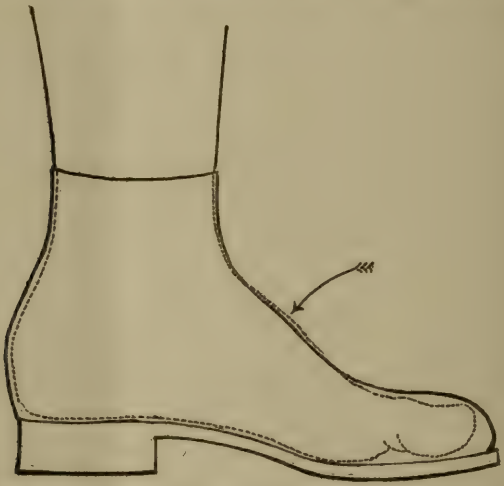

Fig. 195.—Solid line shows outline of shoe; dotted line, outline of foot; arrow shows point of excessive pressure if shoe is too low at the instep.

Signs and Symptoms.—Though never fatal, it causes much discomfort, frequently considerable pain, and often not a little incapacity, the latter varying in degree from a slight temporary functional impairment to complete, more or less permanent, disability. The first change that usually occurs in the development of static flat-foot is relative general muscular weakness, accompanied by more pronounced weakness of special muscles, especially the tibialis anticus, tibialis posticus, and short plantar muscles. This throws excessive strain on the fascia and ligaments, which is followed by their stretching, causing a rotation of the bones with a change of their axis and weight-bearing surfaces, which must sooner or later result in a change of their shape. If now the opposing muscles, in their attempt to immobilize the painful member, become hypertrophied, rigid, and spastic, we have the most troublesome condition, so-called rigid flat-foot. If, however, this hypertrophy of the muscles does not occur and the causative factors are not removed, we will get the complete breaking down of the arch, robbing the foot of all of its elasticity. This sequence is by no means universal, but certainly very common, and I have frequently seen all of these stages and have been able to follow one stage after the other in the history of some of these cases.

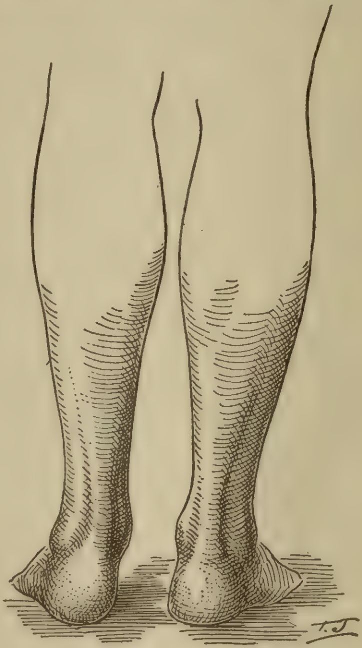

Fig. 196.—The left leg illustrates the outward deflection of the tendo achillis characteristic of flat-foot; right leg normal.

The one never-failing sign of flat-foot is the outward deflection of the lower end of the tendo achillis, as illustrated on the left leg in Fig. 196. This sign was first described by Helbing and, so far as my experience goes, it is always present even in the early potential cases; in fact, it is a much more reliable and characteristic sign than is the breaking of the arch itself, and appears much earlier in the disease.

Another sign is the peculiar gait of the patient. This differs somewhat in the different types of static flat-foot. In the potential variety the patient steps rather gingerly, as though walking on peas; while in the acquired flat-foot there is a marked abduction and eversion, with the knee slightly flexed and the back bent and the foot hitting the ground rather hard.

The tendency to fatigue, weakness, and discomfort, even on the slightest exertion, is also often very marked. The patient is disinclined to arise when in a sitting position, and lacks alertness, sits down, or assumes the "attitude of rest" whenever possible, often complaining of cramps in the calf and spasm of the foot, which throws the foot into a position of abduction and eversion. In the severe cases the discomfort may change to severe pain, and as the disease progresses a number of characteristic points of pain are likely to develop. The first and most common is at the inner portion of the foot, where the tuberosity of the scaphoid and the head of the astragalus make pressure on the calcaneoscaphoid ligament. Sometimes the irritation becomes so severe here that a bursa develops, which may become inflamed, and the pain may become so excruciating as to make all locomotion impossible. Another common point of pain is on the dorsum of the foot, where the scaphoid impinges on the neck of the astragalus. A third point of pain is just in front of the external malleolus, where a point of friction occurs between the external malleolus and the astragalus, due to the changed relation of these bones. Another point of pain is over the plantar surface of the heel. This pain has on a number of occasions been falsely diagnosed as a true inflammatory periostitis. While an inflammatory periostitis does appear here occasionally, a traumatic flat-foot periosteal irritation is undoubtedly the much more frequent cause of pain in this location. I have seen quite a number of these patients operated upon without relief, who subsequently secured complete relief when their flat-foot was properly treated. Another common point of pain is found in the ball of the foot at the metatarsal phalangeal junction, so often described as Morton's toe.

Occasionally flat-foot causes pain in the hip and the small of the back. Other common symptoms of flat-foot are numbness, coldness, clamminess, and cyanosis of the extremities.

In the successful treatment of flat-foot it is very interesting to observe how one after the other of these symptoms will disappear. One of the first to appear and also to disappear, after the proper treatment has been instituted, is the excessive sweating of the feet from which these patients complain. The following history is typical of the ordinary beginning potential flat-foot:

Male, seventeen years of age, moderately slender, 6 feet tall, weight 154 pounds, made biggest growth in last two years; had no children's diseases except diphtheria at two years of age. About three or four years ago began to have trouble with feet and ankle-joints. Later went to Florida and worked on a farm. During this time feet troubled him greater part of the time. Complained of pain in arches of both feet. At present complains of pains when he walks, and a feeling as though foot was falling flat and there is considerable numbness of limbs when walking. Cannot engage in any out-of-door sports. The calf muscles not very well developed considering height and weight of patient. No muscle spasm, but, on standing, arches drop down considerably. Marked prominence of scaphoid with considerable pain and tenderness over calcaneoscaphoid ligament and very pronounced outward deflection of both tendo achilles. (In Fig. 196 the sketch on the left is an accurate reproduction of the condition found in the left leg of this patient; the sketch on the right represents the normal by contrast.) Feet perspiring considerably, cold and clammy. Patient first seen and treated as hereafter described on November 14, 1917, then again on December 7, 1917, when the cyanosis had entirely disappeared. Examined again January 11, 1918, when all symptoms had entirely disappeared—no pain, numbness, or sweating.

As stated above, this was a beginning potential flat-foot which, while it had not resulted in any serious incapacity, had been very annoying, and, if left untreated, would probably soon have developed into the spastic form of potential flat-foot, which is much more painful and causes much greater incapacity, and the principal symptoms of which are muscular rigidity, eversion and abduction, and inability to bring the foot into its normal adducted inverted position either voluntarily or by passive motion. In some of these cases the muscular rigidity becomes so pronounced that even a general anesthetic will not completely relax the abductor muscles. This type of rigid spastic potential flat-foot is often met with even before the arch begins to break, is often extremely painful, and may cause a high degree of incapacity, as the following case history will illustrate:

Some years ago a merchant, thirty-three years of age, 5 feet 10½ inches tall, weight 190 pounds, came to see me with a history that two years previously he had been having trouble with his feet, suffering much discomfort and considerable pain, which occasionally made walking almost impossible. He hobbled along with two canes, wore steel flat-foot insoles attached to braces extending within a few inches of his knees, without relief. The arches showed no tendency toward flatness, but there was marked abduction and excessive rigidity of the abductor muscles, making it impossible to bring the feet into normal position. After eight months of treatment the patient made a complete recovery.

If such a case as this is not relieved, it will ultimately progress to complete static flat-foot, with a complete breaking of the arch. In this condition the pain is often less severe than it is in the potential flat-foot, but the patient acquires a displeasing shambling gait and his endurance is usually very greatly reduced.

Well-made imprints of the sole of the foot are often of value in making a differential diagnosis between potential and acquired static flat-foot and of interest in watching the progress of the condition, but we must not forget that there is no direct relation between the sinking in of the arch and the severity of the symptoms or the degree of the disability. A potential flat-foot may be so painful as to incapacitate the patient from all work and yet show no loss of arch. While, on the other hand, a fully developed static flat-foot may cause relatively little pain, though it always impairs the usefulness of the foot more or less. We must ever remember that "flat-foot is a compound deformity in which the abnormal relation in foot and leg causing the improper distribution of weight and strain and disuse of normal function is of vastly greater importance than the depression of the arch, which has given the name to the disability."

Treatment.—The treatment may be divided into prophylactic and active. Great care should be taken that young persons during puberty and adolescence be not exposed to excessive strain. This same precaution should be observed following an acute illness or when a person is, for any reason, greatly below par. Again, persons who have a tendency to obesity, particularly if they have relatively weak muscles, should have their muscles strengthened by proper physical exercises and their weight reduced by suitable diet. Excessive burden bearing, particularly during the period of adolescence, should be avoided. Persons whose trade or vocation requires them to stand for long periods of time should be taught to stand with their feet close together and parallel and should be cautioned never to assume the "attitude of rest" or to stand with their toes out. Toeing out, both in standing and walking, favors the production of flat-foot and should constantly be discouraged. It lowers endurance and does not favor gracefulness, as is so commonly supposed. Another important prophylactic measure is suitable shoes. The shoe manufacturer should never forget that space has three dimensions, and that all of the three dimensions must be taken into consideration in the manufacture of satisfactory shoes. Length and width are usually considered, but height, particularly over the instep, is rarely thought of, with the result shown in Fig. 195 and considered under Etiology.

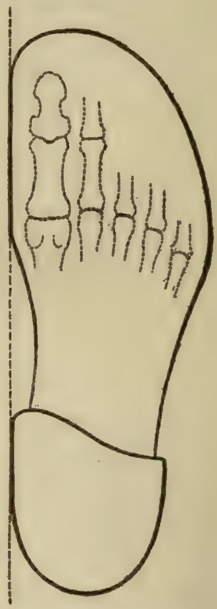

Fig. 197.—General outline of the best type of shoe, a straight last and widest where the ball of the foot, that is, the metatarsal phalangeal junction, should rest.

The inner border of the shoe should be a straight line, as shown in Fig. 197. If the shoe points at all, it should point only from the outer side. The tip of the great toe should never be crowded outward. If these two precautions are not observed the foot is sure to be forced into abduction and eversion sooner or later, and a more or less pronounced flat-foot is bound to develop. The metatarsal phalangeal joint should come at the widest point of the shoe, as also illustrated in Fig. 197. This is important in order that elasticity and springiness of the arch of the foot be not impaired and that the shoe may be comfortably fitted to the foot.

Persons with unusually high insteps or unusually long arches in proportion to the other dimensions of the foot should always have shoes made over a special last. This can easily be secured by first making a plaster-of-Paris cast of the foot and then having the last-maker make a last according to the dimensions of the cast. Having shoes made in this way prevents the necessity of breaking in shoes, is of great protection to the foot, and a decided saving in the cost of shoes, because if the shoe does not fit, not only will the foot be broken in, but the shoe as well, as a consequence of which it wears out sooner than it would if properly fitted to the foot. A properly fitted shoe should be as comfortable the first day it is worn as the day it is discarded.

Strengthening the general muscular system of the body by proper hygienic measures and suitable exercise are two of the most important therapeutic remedies to be employed in the relief of this condition. For a number of years I directed my flat-foot patients to procure and use Schreberer's little book on physical exercise. Almost since the very beginning of the war I have been unable to secure this book, and, as I could not find a suitable substitute, felt compelled to publish a book on "Physical Exercises for Invalids and Convalescents," which I find very useful in this and allied conditions. In addition to the exercises contained in this book I teach the patient one special exercise, which consists in a rotation of the foot, first inward; then upward; then outward; and then downward to the first position, with special emphasis on the inward and upward parts of the exercise. This exercise can be taken either in the lying, sitting, or standing position, and should be done ten times with each foot two or three times each day. It is probably the most important exercise because the purpose is to strengthen the tibialis anticus and posticus muscles —the two muscles which bear the closest relation to flat-foot. If these two are unusually weak, flat-foot is almost sure to develop, while, if they are in normal health and strength, flat-foot is not likely to develop.

A good general massage is of very great value in building up the general muscular system and also in insuring proper development of these special muscles, but massage should be given by a person well trained in the art, otherwise it may either prove valueless or actually do harm.

In this connection it is necessary to say a word about flat-foot insoles. While flat-foot insoles give temporary relief in some cases, my experience with them leads me to the conclusion that they never cure a case of flat-foot and that they actually make many cases worse. They are wrong in principle because instead of strengthening the tibialis anticus and posticus muscles they actually weaken them; instead of adducting and inverting the foot they actually force the foot into abduction and eversion; and instead of relieving pressure at the points of pain they often actually increase pressure at these points. I have seen some cases of flat-foot that were temporarily relieved by flat-foot insoles only to become much worse later, and I have seen a number made worse from the very beginning. Some years ago I treated a patient for flat-foot who had in his possession over thirty pairs of flat-foot insoles: some of them procured ready made from the shoe store; some of them made by orthopedic instrument makers, and a great many of them made at the direction of some of our most eminent orthopedic surgeons. In spite of all of these appliances, it was almost impossible for him to walk. After discarding all of the flat-foot insoles and following the treatment above outlined and the strapping which I am now to describe, he was completely relieved in the course of about six months—not only was he relieved of all of his symptoms, but a fairly good arch was again re-established.

Strapping.—The special method of strapping which I have used in all of my cases of potential and acquired static flat-foot during the past twenty years is supplementary to the general treatment above outlined. I go into the minutest detail in the

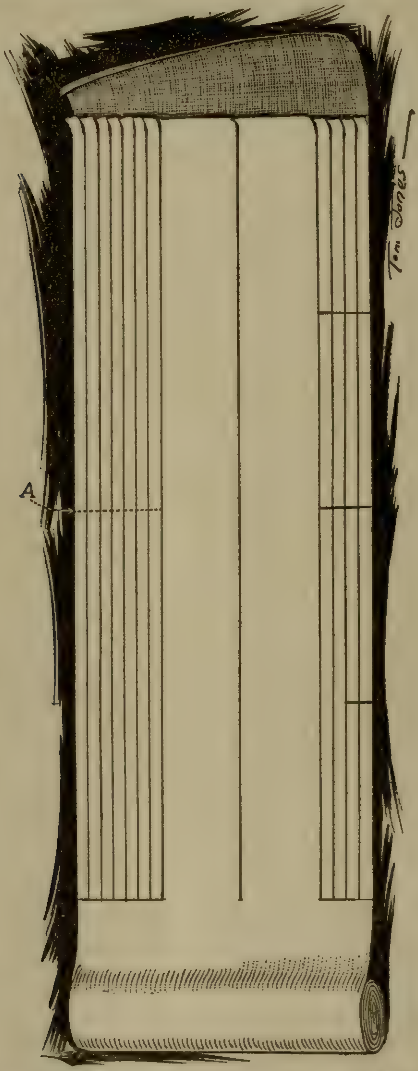

Fig. 198.—Manner in which the zinc oxid plaster is marked off preparatory to the cutting of the strips.

description of this method because upon the accuracy with which it is applied depends very largely the results obtained.

First, I select the best grade of zinc oxid adhesive plaster that I am able to procure. I always use this in the 12-inch rolls because I have found this size much more convenient, much less expensive, and to adhere much better than the adhesive plaster one buys on spools in the drug stores. In handling the adhesive

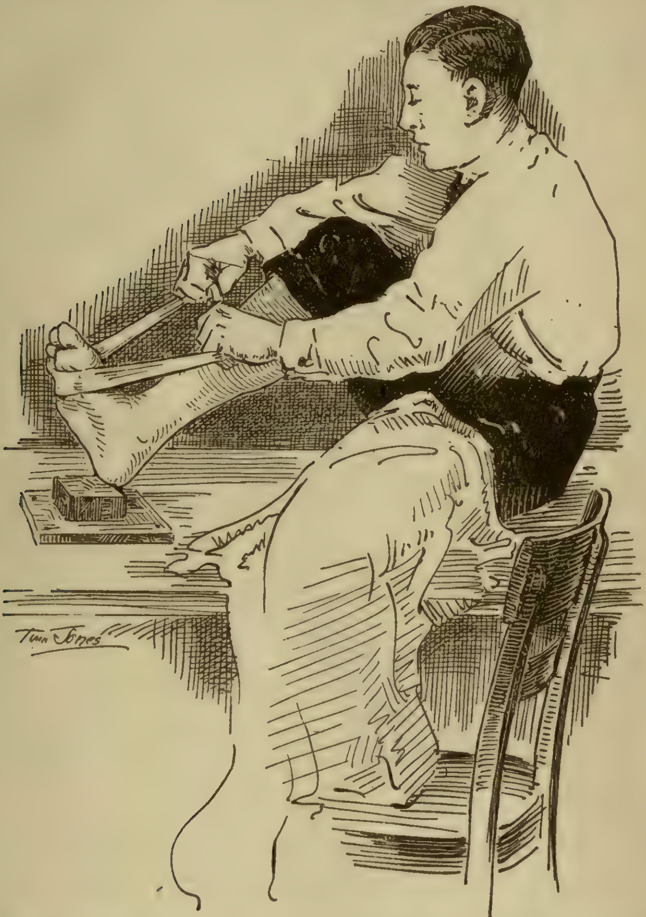

Fig. 199.—Showing how hospital patient holds foot preparatory to strapping; the heel rests on a block which is firmly anchored to the table.

plaster great care must be exercised in not unnecessarily robbing it of any of its adhesive quality before it is applied. The adhesive surface of the plaster should not be unnecessarily handled, especially with perspiring hands or by first sticking it on walls or gowns, etc. The more of the adhesive quality that it retains—in other words, the better the adhesive sticks when once applied to the foot—the quicker the desired result will be secured.

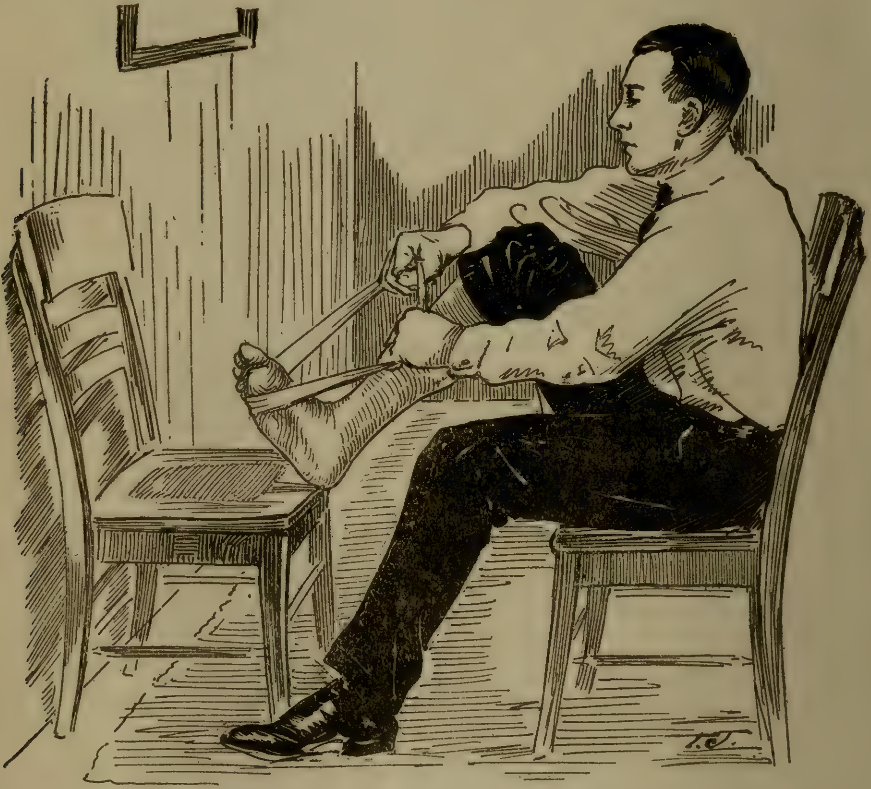

Fig. 200.—Another method of supporting the foot preparatory to strapping. The heel rests on a chair which is backed up against the wall to prevent its slipping away.

For the purpose of strapping an adult male patient's foot of average size I mark off seven strips $\frac{1}{2}$ inch wide by 32 inches long, with a cross line at the middle, as shown by line *A*, Fig. 198, fourteen strips ½ inch wide by 8 inches long, two strips ½ inch wide by 16 inches long, and divide the balance of the adhesive plaster in two strips each 3¼ inches wide (Fig. 198).

If the patient is a hospital patient, he is now placed on an operating table, in the position illustrated in Fig. 199, with the heel on a small block, a loop of hard roller bandage of convenient length thrown across his foot. The operating surgeon now places the foot in the proper position of adduction and inversion with the ankle at a little less than right angle. The patient is then directed to make tension on the hard roller bandage so as to maintain the foot in this position until the strapping is completed. By grasping the bandage a little further down with the inner hand and making greater tension with this hand the position is usually maintained without much difficulty (Fig. 199).

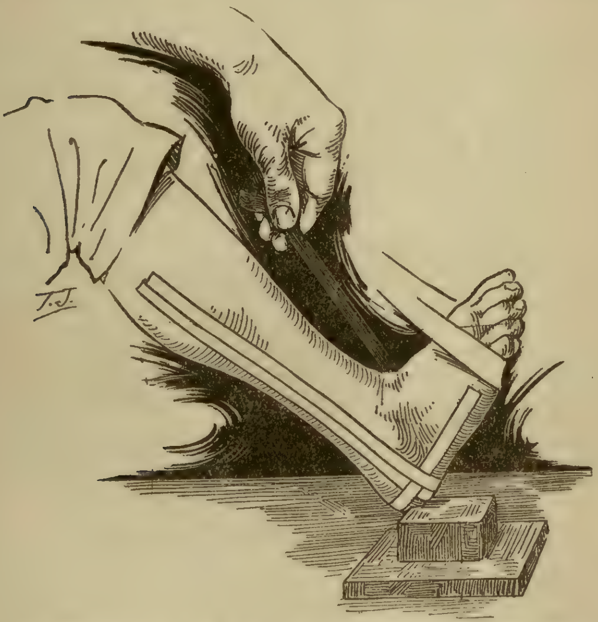

Fig. 201.—The application of the first two long strips and one outer short strip.

In high grades of spastic flat-foot only partial correction of the abnormal position is possible at the first strapping, but with repeated strappings the spasticity and deformity gradually subside, and ultimately the proper degree of inversion and adduction can always be attained.

If the patient is an office patient, the position represented in Fig. 200 is assumed. By being careful to place the chair on which the foot is rested against the wall, the foot can be held in the proper position while the strapping is proceeded with (Fig. 201).

The middle line of one of the ½ by 32 inch adhesive strips is now placed on the middle of the heel, about 1 inch from its posterior border, applied loosely to the outer surface of the leg, as illustrated in Fig. 201, then tightly on the inner surface of the leg. One of the adhesive strips ½ by 8 inches is now placed on the outer surface of the foot parallel to the sole, as shown in Fig. 201, and another, similarly, on the inner surface of the foot (Fig. 201). The long and short strips are now applied alternately, as shown in Figs. 201 and 202, until they have all been applied, each succeeding one slightly overlapping its predecessor. One of the ½ by 16 inch strips is now applied to the anterior external surface of

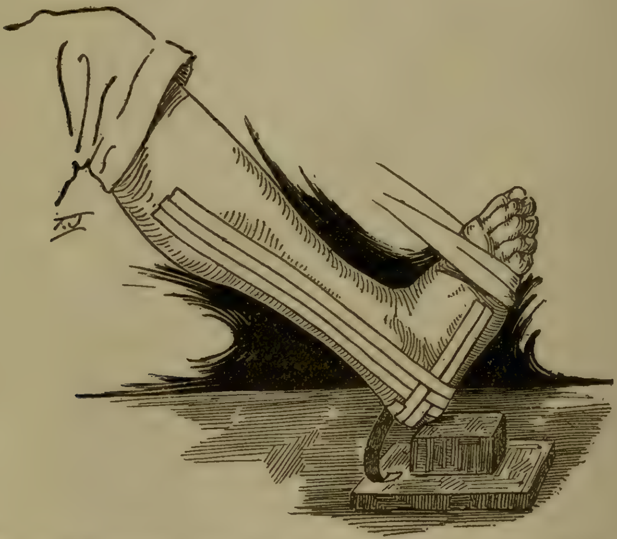

Fig. 202.—The strapping continued; three long strips and four short strips have been applied and the fifth short strip is being applied.

the foot, just anterior to the last 32-inch strip and slightly overlapping it, and brought around the inner surface of the foot and up the front of the leg, as shown at *A* in Fig. 203. The second ½ by 16 inch strip is now applied, slightly overlapping this one. Now the circumference of the leg is taken just above the thickest point of the calf, one of the 3¼ inch strips is cut an inch shorter than the circumference and applied circularly, as shown in Fig. 204. The remaining circular strips are now applied, as shown in this figure, being sure not to permit the strips to overlap or even to meet posteriorly. This point is of very great importance, because if they do overlap the circulation of the leg and foot are interfered with and the muscles do not secure enough nutrition to properly develop and regenerate.

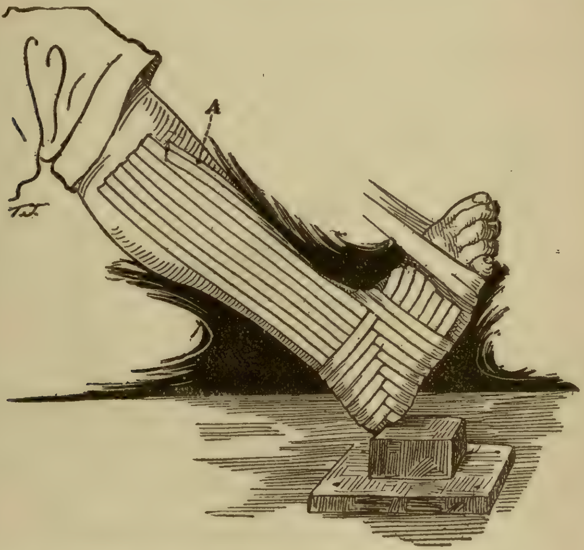

Fig. 203.—The strapping nearly completed; all the ½ by 32 inch, ½ by 8 inch, and ½ by 16 inch strips have been applied.

The straps, applied as directed in the preceding paragraph, will remain in place and be effective for from four to eight weeks, depending upon the kind of work the individual does, upon the quality of the adhesive plaster, and upon whether the patient perspires greatly or not. When the straps begin to get loose, they are removed, preferably in the evening; the foot washed with soap and warm water, and restrapped the next morning, until the patient is relieved of his trouble. From one to ten strappings will not only relieve but cure practically every case of static flat-foot.

Prognosis.—Contrary to the generally accepted opinion even among medical men, the prognosis in static flat-foot of both varieties is very good, provided the above line of treatment is carefully followed both by the attending surgeon and the patient. I have now followed the above line of treatment for over twenty years, and every patient suffering from this condition that has persisted in the treatment has been relieved of his symptoms, and a very large percentage of them have actually been anatomically cured. While I realize that the last statement may seem incredible to some, yet flat-foot reprints taken before treatment has been instituted and again when a symptomatic cure has been secured proves its correctness incontrovertibly.

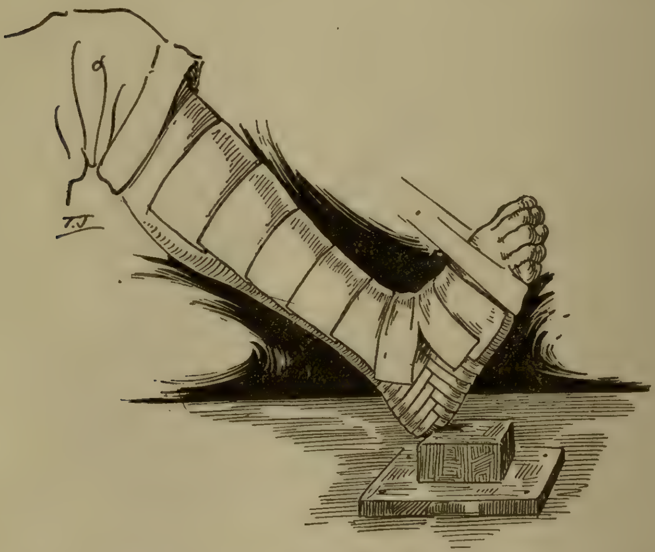

Fig. 204.—The strapping completed, the three ¾-inch strips have been put on to hold down the other strips. Note that they do not overlap posteriorly.

The chief objects of the treatment above outlined are to overcome any disproportion which may exist between the strength of the arch and the weight to be borne, and to place the arch at its greatest possible mechanical advantage, namely, the center of the arch directly under its burden. If these two main objects are accomplished by the treatment, the minor objects necessarily fall into line, and, as a natural consequence, the symptoms disappear and a cure results.

CLINIC OF DR. COLEMAN G. BUFORD

Children's Memorial Hospital

UMBILICAL HERNIA OF INFANTS AND CHILDREN

Summary: Etiology—importance of digestive disturbance and neglect; the two types—characteristics of each; prophylaxis and non-operative treatment—the Coley hemispheric wooden buttons and the adhesive plaster girdle—their proper application—general management; indications for operation—technic; after-treatment.

Umbilical hernia in young children is not a new subject, but because of the large number of children appearing at the Surgical Clinic of the Children's Memorial Hospital exhibiting this defect naturally the subject has become a very important one with us. Were it not true that there are so many vague and improper impressions abroad concerning this affection I would not think of elaborating upon it. The proportion is so much larger in dispensary than in private practice that I am led to the belief that prenatal and postnatal malnourishment is a very important etiologic factor, and that these children are more subject to digestive disturbances and neglect, and, consequently, cry more, thus inviting hernial protrusions. Excessive coughing, as in bronchitis and whooping-cough, increasing intra-abdominal pressure, reopens rings which have been previously closed.

There are two distinct types of umbilical hernia: those protruding through apertures beside the obliterated cords and those protruding through openings in the abdominal fascia just above the umbilicus.

The apertures of those which lie beside the cord are due to failure of the fibrous structures surrounding the cord to close by contraction, or if once closed, they reopen on account of undue intra-abdominal pressure or a weak ring, or both. The rings are small, rarely larger than a pea, elongated, the long axis usually lying horizontally, and are frequently angulated. The free margins of the rings are firm, thick, elevated, and rounded. The contents of the sacs are usually omentum, but occasionally a knuckle of gut fills the sac. Both types are usually reducible. The protrusion rarely exceeds the size of one or two peas, and occasionally one sees the umbilicus pushed forward and downward, the protruding mass assuming the shape of a nipple or an infant's penis.

In the second group are those which protrude through apertures in the abdominal fascia just above the umbilicus, their lower margin reaching to the upper border of the contracted ring previously described, but the rings of these never open into one another; neither have I seen the two types present in the same patient. These are not true umbilical hernias, but are diastases in the linea alba, of which there may be others above. These rings are relatively large, often reaching 1¼ inches in diameter or larger. Their margins are very thin and pliable. The protrusion is rotund and the contents usually reducible (Fig. 205).

Treatment.—*Prophylaxis.*—In view of my finding during operations so many long and very narrow peritoneal protrusions so very closely blended with the umbilicus I am convinced that most of the first type are congenital hernia which remain open or, if closed, are destined to reopen in early infancy. The peritoneal protrusions have been engaged in the rings and serve as points of easy egress for knuckles of omentum or intestine, therefore prophylaxis is of little benefit in these, usually only delaying the appearance of a hernia.

In the second type there is little doubt that lessened crying and coughing through good care and feeding and gentle support of the abdomen, by use of a binder, are beneficial prophylactic measures. If these weak areas are not opened up in early life there is a good chance of them becoming thicker and stronger as the child matures. Whatever good may be said of the abdominal binders, used so commonly in early infancy as an abdominal supporter, they are too frequently applied tightly and, I think, become a source of evil through limiting peristalsis and inviting intestinal stasis and resultant digestive disturbances with all that goes in their wake.

Non-operative Treatment.—The usual routine of non-operative treatment consists of the use of cotton wads, buttons, coins, and metal plates held on the navel by short strips of adhesive plaster. These cannot resist the protrusion, since the plaster has no fixed point. Invagination of the navel through drawing the skin together on either side by adhesive has many advocates. I have never seen any benefit from it. Manufactured and home-made removable belts and trusses both containing pads for retaining the hernia are in common use. Occasionally benefit is derived from these, but, on the whole, a removable appliance is dislodged frequently, used irregularly, and seldom worn at night, consequently the frequent protrusions

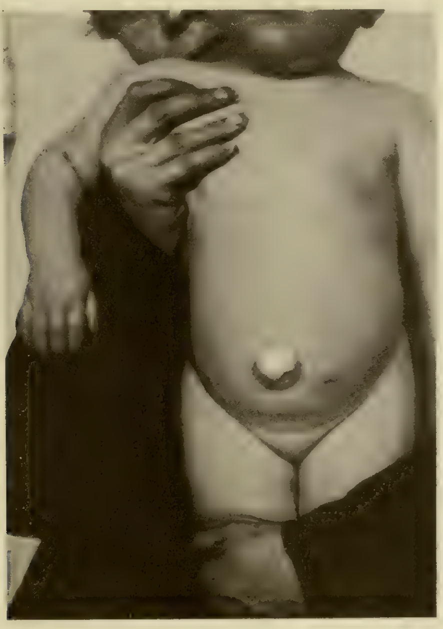

Fig. 205.—Large umbilical hernia. Aperture is in abdominal fascia; therefore this is not a true umbilical hernia.

overcome whatever contraction has taken place in the ring while the pad was worn. I was impressed with the uncertainty of all of these methods many years ago, and in casting about for a method which would keep the button in place and give a fixed point for counterpressure I adopted, with some modifications, a method described by Coley many years ago, consisting of hemispheric wooden button molds (Fig. 206). These should be $\frac{3}{4}$ inch in diameter or larger. They are covered on the convex surface by Z. O. adhesive plaster carefully stretched over it and ironed down to perfect smoothness with the finger-nail and evenly trimmed around the base. Its flat surface is placed upon the middle of a strip of Z. O. adhesive $1\frac{1}{2}$ to $2\frac{3}{4}$ inches wide, according to the size of the child, and long enough to more than encircle the body. The plaster is partly lined with gauze or sheet wadding to preserve part of the skin from the irritating effects of the plaster, which area will be used to apply plaster at the next dressing. The plaster is applied with such obliquity, following the bodily contour, that its upper and lower edges exert equal tension (Fig. 207). When the edges cause abrasions they should be turned in or lined with sheet wadding. No dusting-powder should ever be applied because it becomes moist with perspiration and macerates the skin. These dressings, if well cared for, last from ten days to

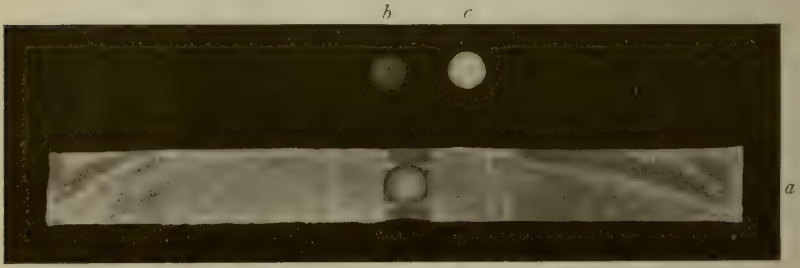

Fig. 206.—*a*. Zinc oxid adhesive plaster partly lined by gauze to prevent adherence of plaster to skin. Button on plaster ready to apply. *b*. Button mold. *c*. Button mold covered with adhesive plaster ironed down to perfect smoothness on convex surface.

four weeks, and should always be changed when they begin to loosen. Upon removal, all resin from the adhesive plaster should be removed from the skin with benzine, which is carefully cleared away with alcohol, followed by water sponging. If the residue of the evaporated benzine is left on the skin and covered, a blister may follow. The only serious drawback to this dressing is the skin irritation induced. Rapid tub bathing is permissible. From a theoretic standpoint such a fixed dressing worn day and night for several months seems most satisfactory, for if properly cared for the herniæ rarely protrude. From a practical standpoint it is also the best dressing available, but does not accomplish as many cures as is supposed. In the small slit-like openings, the true umbilical hernia, among which we might expect the highest percentage of cures, I rarely have cures during the months of early life when parents are most willing to bring their children for regular care, but I have now had sufficient opportunity to observe these in later life to have been impressed with the belief that the majority of this type undergo spontaneous cure before the pubescent period, and that the closure of the rings usually occur in well-developed children after they have taken on active out-door sports. My failure to cure many of these true umbilical herniæ by non-operative means has caused me to refrain from urging continuance of treatment if after six to nine months of constant wearing of the appliance there has been no marked improvement. The frequency of spontaneous cure after the seventh or eighth year and the rarity of strangulation among these prompts me to defer operation in all but the definitely hopeless type, which are those

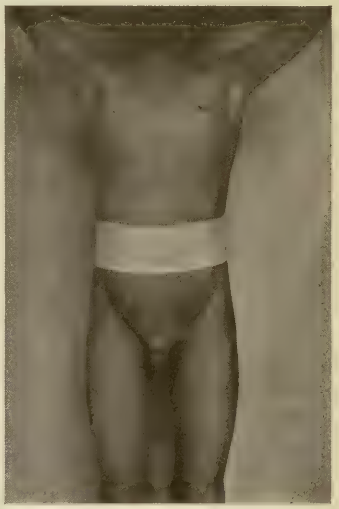

Fig. 207.—Adhesive plaster and button applied.

with the very thick, rounded edges, lax rings, and those with long peritoneal protrusions.

As paradoxic as it may seem, by use of the button and adhesive belt I have had the best results in those of the second group, whose apertures are just above the navel and which are really apertures in the linea alba. A fair percentage are cured in six months to a year when treatment is begun before the child is six months of age. The cures diminish in frequency as age advances. Very few of these patients return because the ring has reopened.

Operative Treatment.—All patients of any age who develop serious digestive disturbances or discomforts possibly due to the hernia, and all incarcerations and strangulations are promptly operated upon. Uncomplicated umbilical herniæ not likely to close are operated upon at a time of convenience, but preferably well after the first year of life when surgical risk begins to lessen and the larger size of the body renders asepsis more possible at the operation and systematic after-care may be more easily carried out.

I am now routinely using a very small semicircular skin incision with its convexity upward, lying above and around the umbilicus. The flap of skin and subcutaneous tissue is dissected up, including the umbilicus, which is thus preserved. The ring is exposed as far as possible at this time, the peritoneal protrusion is found, partly freed, and then opened. While the skin-flap is lifted the peritoneum is carefully dissected off the navel. I know of no place where the peritoneum blends so tightly with another tissue as in true umbilical hernia. The dissection is carried on with a sharp knife, care being taken not to perforate the skin. When the sac is made free where it lies outside the abdomen it is then freed from the ring and well under it. At this point it usually becomes thin and may be easily broken through. If made free intact, it is ligated and the sac cut off; if torn, it is sutured in the direction it will most easily approximate.

The closure of the ring is accomplished by bringing the lower over the upper edge with the fewest No. 1 chromic catgut mattress sutures, usually two, never more than three. The free edge of the lower margin is then pulled upward, spread out, and fixed in place by one or two sutures, thus giving broad approximation of surfaces. If there is sufficient subcutaneous tissue it is brought together with fine iodin catgut. The skin is closed by a subcutaneous silkworm-gut suture which is tied over a very small, thin strip of gauze. No drainage is used. The abdomen is encircled with adhesive plaster and the child put to bed with the following provisions: Freedom of movement in bed. If necessary may sit up in an easy position to attend to the calls of nature. Warm covering for upper part of body;

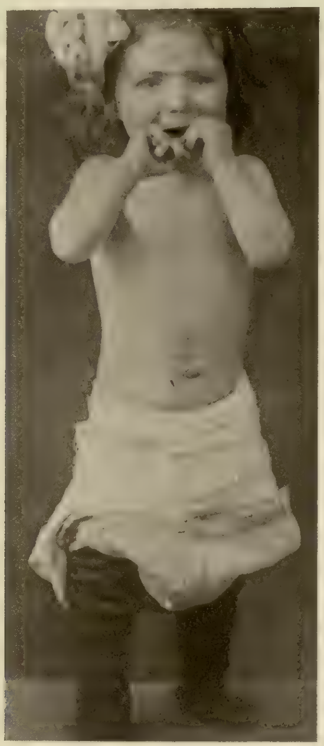

Fig. 208.—Small scar above navel resulting from operation for umbilical hernia. Navel preserved. The semilunar incision becomes almost straight when closed by subcuticular suture.

gowns and shirts are rolled and fixed well above the level of the umbilicus. Stockings are worn in cold weather. No diapers or other garments are worn about the abdomen or pelvis which might become urine soaked. In males a wide flap of adhesive is applied to the pubes so as to overhang the penis as a small apron. The overhanging part is prevented from sticking to the skin by folding it under upon itself or lining it with gutta-percha or gauze. This apron, if kept spread out, prevents the urine from an erected penis from reaching the abdomen or bed-covers. In all pediatric surgery I especially fear urinary infiltration of the sutures. These patients seldom show postoperative illnesses and are pretty comfortable from the start. Children are kept in bed two weeks, after which they are gradually allowed to go about, and may have their full freedom by the end of three weeks. The small scars resulting from the operation are not conspicuous (Fig. 208). The preservation of the navel leaves a better appearance of the abdomen. I recall only one infection, which was superficial and did not interfere with the favorable plastic result. No umbilical herniæ operated upon in the hospital in the last ten years have returned with a recurrence and there have been no deaths.

CLINIC OF DR. ROGER T. VAUGHAN

Cook County Hospital

INCARCERATED RIGHT SCROTAL HERNIA DUE TO ADHERENT CARCINOMATOUS OMENTUM

Summary: A patient presenting an irreducible, nodular swelling in the right inguinal canal and scrotum; diagnosis—similarity of lesions to "Perlsucht" of cattle; pathologist's report—carcinoma simplex, metastatic in omentum.

HISTORY

The patient is twenty-seven years old, single, a baggage porter, nationality American. He was admitted to the hospital January 29, 1918, at 5.15 P. M.

The patient states that he has had a right scrotal hernia for ten years. At various times he has experienced slight attacks of pain and cramps localized chiefly in the region of the hernia, but he has had no previous attack so severe as the present or accompanied by vomiting or even by nausea. Until last week he has always been able to reduce the hernia at will; but last week, he does not know on exactly which day, it came down and has remained down, since he is unable to reduce it. Furthermore, he has been unable to work on account of the pain and tenderness at the present hernial site. He has, however, had no nausea or vomiting. His bowels have moved every day and he had a bowel movement this morning. He is normally inclined to be constipated and so takes oil in some form rather frequently. Otherwise he has no complaints, no headache, no cough, no dyspnea, no abdominal distress otherwise than above noted. He thinks he has had some of the diseases of childhood, but does not know which. He has never been operated on. He had a Neisserian infection in 1918, but denies other venereal illness.

Father, mother, five brothers, and three sisters are living and well. The patient states that he has lost 18 pounds in weight in the last six months. He does not know why unless it be due to hard work recently as a baggage porter. Appetite is good.

He has not been feeling quite so strong as usual, he thinks, for about two weeks preceding the onset of his present trouble. He has had occasional cramp-like pains across his lower abdomen, not severe enough to double him up, for some time, perhaps a few months. These cramps are usually relieved by bowel movement or passing gas. No night-sweats at any time and no pain in chest or abdomen otherwise than has been mentioned.

COMMENTS AND OPERATION

We have to do here with an incarcerated hernia of some days' duration. It is hard, tender and nodular, and so evidently contains omentum. Since there has been no nausea or vomiting and no obstipation it is clear there is no obstruction of the bowel. The indication for operation is double. He has first an acute incarceration, which might readily lead to strangulation, and should be operated in any event. Besides that, the pain and discomfort are keeping him from working. The nodular character and rather marked tenderness over the hernia are a little unusual for the average case of incarcerated hernia, but hardly enough so to be striking. The patient is a little tympanitic over the abdomen, but not much more so than we see occasionally in constipated individuals.

Temperature was 98° F. on admission to the hospital, pulse 64, and respiration 20. Systolic blood-pressure was 116, diastolic 74. Urine negative for albumin, sugar, or casts. No white cell count was made.

Operation.—[The usual inguinal dissection was carried out. The sac was exposed and opened. On opening it its contents presented a striking picture. Nothing but omentum was present, but throughout it were numerous white, glistening nodules varying in size from a pinhead to a cherry. Some of the nodules were adherent to the sac, thus explaining the irreducibility of the mass. There were also nodules growing in the sac wall itself. On pulling down the omentum as far as it would come, it was seen to be studded with similar nodules. Other nodules could be felt by the exploring fingers through the internal ring as far on each side of the peritoneal cavity as the fingers could reach.

The *anatomic* diagnosis lay between metastatic carcinoma of the omentum, arising from some primary focus at present unknown, or bovine tuberculosis. The pearl-necklace-like character of the lesions and the youth of the patient, only twenty-seven years old, made the surgeon more inclined to the diagnosis of a bovine tuberculosis, rare as that lesion is. As much omentum was pulled down as possible, ligated, and excised. All the sac was excised and the neck of the sac sutured. The wound was swabbed out with 5 per cent. carbolic and the usual Bassini closure performed without drainage.]

If this be a metastatic carcinoma of the omentum, it is the first case which I have seen causing a hernial incarceration. I cannot remember ever having run across the report of such a case in the literature. Of course, these cases must occur occasionally, but since they always end in fatalities, the surgeon who observes them probably does not think of reporting them. Clinically, metastatic carcinoma of the peritoneum is about as frequent as peritoneal tuberculosis; and there are plenty of reports in the literature of tuberculosis of hernial sacs. Dr. Victor Schrager[1] of our County Hospital staff made a careful study of hernial tuberculosis a few years ago in connection with a case of his own. He found the literature on the subject already extensive.

A. A. Worobjew (in the Wratschebnaja Gaz., 1910, Nos. 4 and 5) reported 40 cases of tuberculosis of hernial sacs, including 5 cases of his own. In 15 of these cases the tuberculosis was confined to the sac alone. M. Segre, of Modena (Clinica Chirurgica, December, 1909), found 167 cases of hernial sac tuberculosis in the literature and reported 2 additional cases of his own. In 23 of these cases the tubercles were found only in the hernial sac.

The specimen that we have here, however (Fig. 209), is not like the ordinary case of subacute or chronic miliary tuberculosis in a hernial sac. The nodules are too large, too white, and too hard for anything except a process of considerable duration. They have no tendency to break down in the center

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[1] Schrager, V.: Surg., Gyn., and Obst., vol. 12, No. 3, 1911.

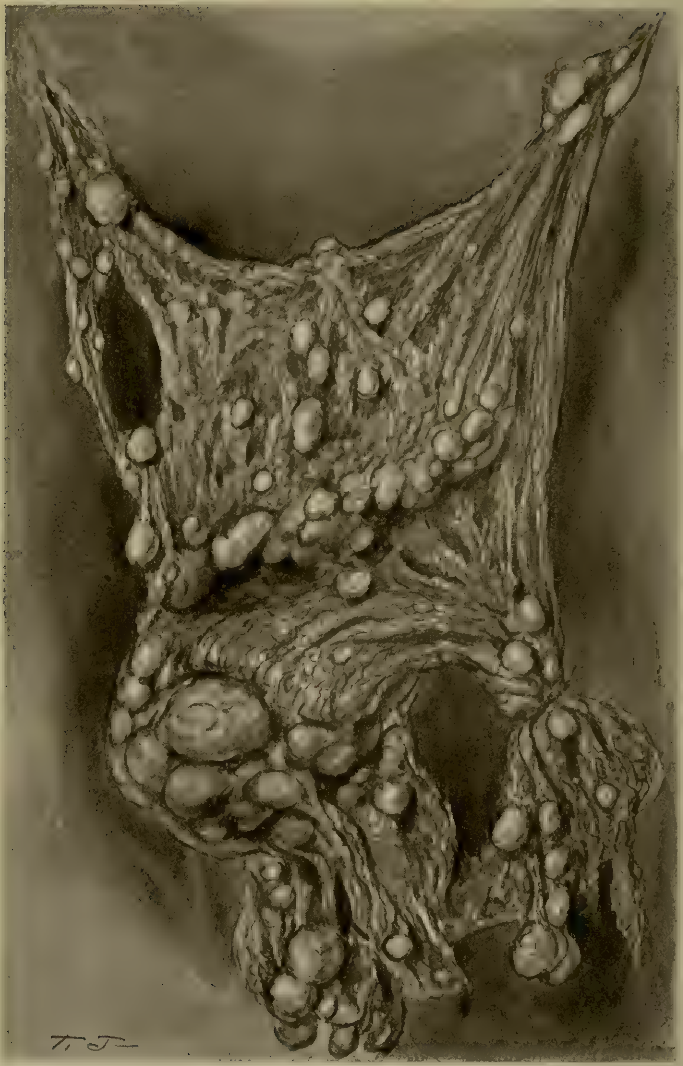

Fig. 209.—Carcinomatosis of omentum in a hernial sac (right inguinal) causing incarceration. Specimen spread out to show extent of the involvement.

either like an ordinary tuberculoma, and have surprisingly little tendency to agglutinate with the adjacent structures or to make peritoneal irritation. It is because of these large pearly white nodules clustering together that I have considered the possibility of this being a bovine tuberculosis (Perlsucht or "pearl-disease" of the Germans), although I have previously seen only one such case involving the peritoneum. But carcinoma of a hernial sac is a rare condition too, and this patient being only twenty-seven years old and having had no previous symptoms suggestive of an abdominal neoplasm, only some loss of weight, 18 pounds, and that during a period of severe physical exertion, I am inclined to think bovine tuberculosis about as likely a diagnosis of this gross specimen as peritoneal carcinoma.

Subsequent Course.—The patient made as uneventful a recovery as any uncomplicated incarcerated hernia. He ran no temperature at any time and had no postanesthetic vomiting or gas-pains. He left the hospital feeling completely recovered, as *he* said, on February 12th. A complete physical examination was made of him without eliciting the source of his primary growth. What *was* located, however, was a large mass of secondary nodules about half the size of a fist in the rectovesical pouch. This mass pushed up the trigone and made a very striking protrusion upward into the bladder, as seen in the cystoscopic examination carried out by Dr. Harry Culver. The bladder mucosa was intact. The rectal mucosa was not adherent to the mass, but there was sufficient protrusion into the rectum, so that his constipation may be partly explained on this ground, though, no doubt, the generalized carcinomatous peritonitis is at least an equal factor in impairing the muscle tone of his bowel wall.

He declined to stay for further *x*-ray investigation and objected to having his stomach pumped out, because he said he felt perfectly well and wanted to go back to work.

Pathologist's Report (Dr. John Nuzum).—The specimen consists of a portion of omentum composed of hard, yellowish-white tumor nodules hanging in a bunch from the omentum and varying in size from a split pea to a walnut.

Microscopic examination: Sections through the various tumor nodules reveal sharply circumscribed islands of atypical epithelial cells without glandular arrangement. These islands are walled off from one another by dense strands of connective tissue. The stroma rather than the epithelial cells predominates throughout the sections.

Diagnosis: Carcinoma simplex, metastatic in the omentum.

Comments.—There were no epithelial pearls to be seen in the sections, so it is probably not an epithelioma. A primary endothelioma of the peritoneum may present a not dissimilar picture both grossly and under the microscope, but is a rare lesion and scarcely to be definitely diagnosed without complete postmortem examination of all the organs in order to eliminate the possibility of a primary focus elsewhere. Carcinoma of the stomach and carcinoma of the rectum are the common forms of carcinoma in the young, and since the proctoscope has eliminated the latter possibility, a primary neoplasm of the stomach is the next most likely guess.

April 8, 1918: The patient returned for observation, since he has not been feeling quite well since leaving the hospital. He has been accepted by the draft examining board, he told me, but I forgot to ask whether it was before or after his operation that he was accepted. If he goes into service, Uncle Sam is likely to lose some insurance money, besides having an invalid on his hands for a time. Of course, if the patient applies for exemption and tells his story, which can be verified by our records, it is impossible that he should be accepted. I tried to get him to come back to the hospital for further study, but he made no definite promise.

If these metastases came from a stomach carcinoma, which is probably the most likely source, did they come by way of the lymphatics or by way of the free peritoneal cavity? Their distribution partly in the omentum and partly in the sac wall would speak in favor of the latter route of spread. A Japanese[1] some years ago, when I was in Vienna, published a careful histologic study of a case of extensive peritoneal carcinomatosis, and proved very definitely that there was no lymphatic spread; that the primary tumor threw off cells into the peritoneal cavity, and that the route of metastasis was exclusively along the peritoneal surface.

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[1] Misumi, J.: Ueber die Genese des metastatischen Karzinoms des Peritoneums, Virchow's Archive, vol. cxcvi, p. 371, 1909.

CLINIC OF DR. THOMAS J. WATKINS

St. Luke's Hospital

A CASE OF BICORNATE UTERUS COMPLICATED BY PARTIAL STRANGULATION OF AN OVARIAN CYST

Summary: Attacks of acute abdominal pain associated with nausea and vomiting in a multiparous woman of twenty-seven; physical examination—laparotomy—supravaginal hysterectomy; justification for hysterectomy in present case.

The following case is presented to you in order to illustrate the importance of taking into consideration the personal element as well as the pathology in determining the treatment in cases of abdominal pelvic surgery.

Mrs. M. C., age twenty-seven, married eight years, weight 131 pounds.

Mother died of tuberculosis. The patient was operated for hernia and enlarged cervical glands seven years ago. For the past year has had severe pain in the right inguinal region, which came on acutely and produced nausea and vomiting. Has had a number of these attacks which have lasted from one to three days.

Menstruation began at thirteen, twenty-eight-day type, duration four days, amount profuse. Fifteen to sixteen napkins are soiled at each period. The pain is severe and confines her to bed for one to three days.

There have been no pregnancies, no vaginal discharge, and no vesical symptoms. Her general health is otherwise quite good.

Physical examination shows a swelling on the left side of the neck about 2 by 4 inches in size.

Pelvic examination reveals a pelvic tumor 4 to 5 inches in diameter posterior and to the right of the uterus. The uterus is crowded forward and to the left and feels about twice the normal size. The left ovary is palpable and normal.

Blood examination gives a white count of 7750 and a differential count about normal.

The diagnosis is cyst of the right ovary with twisted pedicle. A cyst is diagnosed, as the tumor and uterus move independently of each other on conjoined palpation. The acute intermittent pains which came on suddenly and which produced nausea are characteristic of twisted pedicle.

The uterus probably contains a small fibroid, as there seems to be nothing else to account for the increased size. The uterus is uniformly of the same consistency, and no fibroid nodule is palpable.

Operation reveals an ovarian cyst with twisted pedicle and a bicornate uterus. The twist was not sufficient to materially affect the nutrition of the tumor, consequently the absence of febrile disturbance and of symptoms of pelvic peritonitis. The uterus is about one and one-half times normal size, due to the congenital malformation. The appendix is very long, contains some concretions, and shows some chronic changes.

Judgment as to what should be done is an important feature in this case. The tumor, of course, should be removed, and the left ovary should not be removed on account of the influence of the internal secretions from the ovary, especially in a woman of her age. We believe that a supravaginal hysterectomy should be made, and be made high enough to preserve a moderate amount of menstrual flow. The reasons are:

1. She has severe dysmenorrhea.
2. She has excessive menstruation.
3. She is probably tubercular.
4. The probabilities of pregnancy are not good, as she has been married eight years and has never been pregnant.
5. There is also the possibility that the cervical glands may be malignant.

We are firmly convinced that judgment in the case of pelvic abdominal surgery is extremely important, and that frequently all the factors which should enter into consideration are not carefully weighed. The operative work is too often based entirely upon the pathology found. The individual consideration of the patient is extremely important, as emphasized in this case. If one were to determine the operation to be done in a case like this, the large uterus would be left and she would continue to suffer for years from dysmenorrhea and menorrhagia, which would materially lessen her resistance to the disease found in the cervical glands, and leaving the uterus would probably be of no benefit to her, as pregnancy is not likely to take place. It is very questionable if pregnancy, if possible in a tubercular patient, is justifiable. The probabilities of the neck glands being tubercular are increased by the family history of tuberculosis.

The question as to whether the amputation of the uterus should be high enough to preserve menstruation or low enough to stop it entirely is possibly debatable. The opinion is entertained by some that the life of the ovary is shortened by the artificial menopause. This would be an argument for the preservation of some menstruation. Personally, I do not believe that an artificial menopause shortens the life of the ovary. This opinion is based upon palpation of the ovaries of patients where an artificial menopause has been produced relative to their size. The amputation that leaves a moderate amount of the musculature of the body can be depended upon to preserve menstruation in a moderate degree.

SYPHILIS WITH EXUDATES IN THE UTERUS, OVARIES, FALLOPIAN TUBES, AND LIVER

Summary: Syphilis of uterus a rare condition; pathology found at operation; response to specific treatment.

This case is presented as the pathology found is especially interesting and as such cases are extremely uncommon in the literature. Dr. Emil Ries is authority for the statement that there is no authentic case in the literature of syphilis of the uterus. This is the most positive case that I have seen, although I have had a few cases of pelvic exudates which I had considered syphilitic and which disappeared after the use of syphilitic remedies.

Mrs. H. C., age twenty-five, weight 130 pounds—three years ago weighed 165 pounds.

Family history and past illnesses negative.

Present illness is loss of strength and uterine hemorrhage. She never feels well, although she has very few definite disturbances. Her health has been failing for three years.

Menstruations have become profuse and gradually lengthened, and she has now been bleeding for four weeks. The last three menstruations have been of three or four weeks' duration. She has had a small amount of white vaginal discharge for many years. No vesical symptoms.

Bowels constipated at times. Appetite good. Sleeps poorly. She is separated from her husband and she says he had syphilis.

Physical Examination.—Abdominal examination is negative.

Pelvic Examination.—There are no signs of infection about the urethra, vagina, or cervix. The uterus is in retroposition, one and a half to two times larger than normal, and is somewhat fixed. It is impossible to reposit the uterus. The uterine appendages may be slightly thickened, but there is no distinct mass in the region of either ovary or tube. She has very little increased pelvic tenderness.

The Wassermann reaction is positive.

Abdominal section reveals the uterus displaced backward and firmly adherent. The peritoneal covering of the uterus is subacutely inflamed and has somewhat the appearance of blisters over the entire surface except where adherent. None of the peritoneum of the uterus is normal. Adhesions involve the uterus, both ovaries and tubes, the posterior surfaces of the broad ligaments, the sigmoid, two or three loops of the small intestine, and the omentum. They are thin and membranous in type. There is very little cellular infiltration and no pus. Both tubes have no pathology except the small amount produced by these membranous adhesions. The adhesions are not easily separated. It is necessary to clamp and tie some of them before cutting in order to be certain not to injure adherent loops of bowel. There are no enlarged glands found in the abdomen. It is especially interesting that there are no enlarged mesenteric glands, as one would expect.

The appendix shows a moderate amount of chronic catarrhal changes. The gall-bladder is negative. The anterior surface of the liver is adherent to the parietal peritoneum. These adhesions seem to cover the entire anterior surface of the liver. It is, however, impossible accurately to verify the extent of adherent surfaces as it is undesirable to break any of the adhesions. Gall-bladder is normal on palpation.

She gave no history of any primary or secondary symptoms, except she has had some sore throat, which was probably syphilitic.

The operation consists in the excision of both tubes, the body of the uterus, and the appendix.

This case illustrates the importance of taking into consideration the personal element in determining the operative work to be done. It would be comparatively easy to shorten up the ligaments and keep this uterus in position, to free the tubes and leave them, as they are not closed, and all the indications are to leave the ovaries. This, we believe, bad surgical judgment, as the amount of denuded peritoneum is large and would result in more adhesions. The uterus is syphilitic and she probably would continue to have menorrhagia. There would be much danger of the adhesions producing a recurrence of the displacement and it would be undesirable for her to bear syphilitic children.

An interesting feature is that there should be so much pathology with so few symptoms. She does manicure work as a profession and has not been obliged to give up work at any time. The pelvic adhesions have produced very few symptoms, as the pelvic symptoms have been almost entirely excessive menstruation. The liver adhesions have produced no symptoms.

There was no microscopic examination made for spirochetes in the tissue, and the sections were consistent with the tissue being syphilitic.

Postscript.—Recovery from the operation was uneventful, except there was slight bleeding from the edge of the abdominal wound, probably the result of the diminished coagulability of the blood due to syphilis. The amount of hemorrhage, however, was not sufficient to require any special treatment.

Inunctions of mercury were commenced soon after the operation, and when she went home at the end of three weeks her general condition was much better than before the operation, due probably to the beneficial effect of mercury.

CLINIC OF DR. GEORGE E. SHAMBAUGH

PRESBYTERIAN HOSPITAL

DEMONSTRATION AND DISCUSSION OF CERTAIN SURGICAL AFFECTIONS OF THE NOSE, THROAT, AND EAR

Case I. Acute mastoid infection with swelling appearing beneath the mastoid in the soft tissues of the neck—the Bezold abscess.
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CASE I. ACUTE MASTOID INFECTION WITH SWELLING APPEARING BENEATH THE MASTOID IN THE SOFT TISSUES OF THE NECK—THE BEZOLD ABSCESS

THE case is that of a Mrs. D., age fifty-four, who developed, the latter part of August, 1917, acute otitis media in the right ear. At the onset of the trouble she suffered some from pain over the mastoid, but this apparently subsided soon after the ear began to discharge, and for six weeks the patient was free from symptoms except the annoyance of profuse purulent discharge from the ear. Six weeks after the onset of the ear trouble the discharge suddenly ceased. A couple of days later she began to be annoyed by swelling and discomfort located below the mastoid and along the line of the sternomastoid muscle, extending around in the region of the parotid.

I saw the patient for the first time soon after this developed. There was no tenderness whatever over the mastoid except at the tip, and this did not seem to be very marked. The swelling below the mastoid was very hard and resembled the condition which one meets with in cases of malignant tumor in this region. The patient had a temperature of 100° F. and a leukocyte count of 12,000. The external canal was quite dry, but the drum membrane still showed evidences of the protracted acute suppuration. The development of the local symptoms in the neck shortly after the cessation of the discharge suggested very strongly a perforation of a mastoid abscess. Early otologists had observed the phenomenon where the cessation of a discharge from the ear was followed in a very short time by the development of serious intracranial symptoms, and had drawn the conclusion that it was a harmful thing to check a running ear, as the checking of the discharge might lead to fatal complications. As a matter of fact, the cessation of the discharge in such cases takes place as the result of the perforation of a mastoid abscess. If this perforation takes place externally, all well and good; there develops a local abscess in the neck or over the mastoid. If the perforation takes place internally the onset of severe symptoms heralds the onset of an intracranial complication, either meningitis, sinus thrombosis, or brain abscess, any one of which, of course, is very apt to end fatally. In such cases the disappearance of the discharge from the external meatus is usually only a temporary one; after a few days the discharge usually returns and becomes quite as profuse as before. In this case which I am discussing the disappearance of the discharge from the external canal lasted for the larger part of a week, when large quantities of pus began to appear in the external canal. This did not seem to be associated in any way with relief of the discomfort which was caused by the swelling developing below the mastoid. When I first saw her the patient objected very strongly to any operation, but ten days later returned and was quite willing to be operated.

In exposing the mastoid process we discovered a small fistula in the outer cortex near the tip, from which pus was oozing. In cleaning out the mastoid process we noted that there were very few pneumatic spaces in the upper half of the process, and at the tip there were only two or three moderate sized cells. These were filled with pus, but there was no very distinct softening of the bone. The small size of the suppurating spaces at the tip of the mastoid suggested at once that the main source for the profuse discharge of pus from the external canal must have been from some other focus. The fact that the patient showed no evidences of any complication except a swelling in the neck excluded the probability of an extradural abscess, so I directed my attention to the region in the neighborhood of the mastoid tip. After a little patience I discovered an opening which led from the mastoid into a cell lying internal to the digastic groove. Here a rather large cell was entered, which was filled with pus. This was cureted out carefully, and the opening into the mastoid process proper was enlarged by the use of the curet. In dressing the wound care was taken that the gauze strip was passed into this deeper lying cell.

The presence of these large spaces which sometimes lie internal to the digastric groove should always be kept in mind in operating upon the mastoid. It is a region where exploratory work cannot be readily carried out, inasmuch as these spaces lie deeper than the facial nerve, and careless operating might very readily result in the severing of this important structure. To explore extensively this region as a routine in mastoid operations is, of course, not justified, and it is only in just such cases as the one here reported, where the profuse discharge from the external canal can hardly be accounted for from conditions discovered in the mastoid process itself, that one is justified in extending the operation to an exploration of this region.

I have some very interesting anatomic preparations showing these large cells which lie internal to the digastic groove. One of these preparations is shown in Fig. 210. An infection of one of these deep-lying cells may, of course, take place independent of any acute infection of the cells which may lie at the tip of the mastoid, and under these circumstances the diagnosis would be extremely difficult, especially because nothing will be shown over the external surface of the mastoid. When the infection in one of these cells breaks through externally no symptoms appear over the mastoid, but a swelling develops somewhere in the neck, the reason being that the pus is confined beneath the deep fascia of the neck. This condition is what is commonly called the Bezold type of mastoiditis.

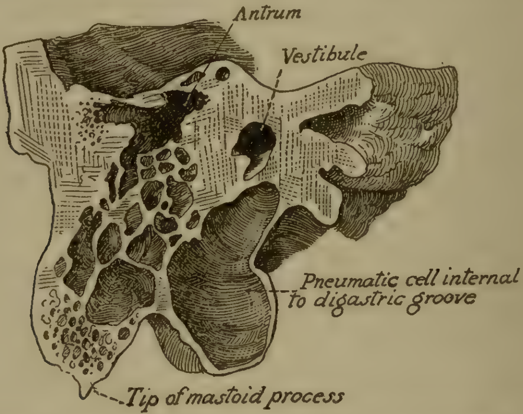

Fig. 210.—Section through the mastoid process. Note the large pneumatic cell lying internal to the digastric groove.

I operated on a case a few years ago for acute mastoid abscess. The case was that of an adult of fifty. The operation itself included a removal of the entire tip and a complete exenteration of the mastoid process. The mastoid cavity closed promptly, but the patient persisted in complaining of pain indefinitely located in the region of the affected mastoid. This kept up with varying severity for a full month after the mastoid wound had entirely healed. The patient showed only an appreciable rise in temperature; it was normal part of the time, and only occasionally would it rise at all above 99° F. The leukocyte count was also scarcely above what could be considered a normal condition, yet the patient complained bitterly of the pain. Careful neurologic examination disclosed no evidence of intracranial trouble. We were inclined to consider the patient a neurasthenic. It was not until fully a month after the healing of the mastoid when we detected the beginning of a swelling in the neck, apparently coming from the deep tissues and about midway between the clavicle and the tip of the mastoid. After this swelling became quite distinct we made an incision through the skin and with dull forceps burrowed deep in the tissues of the neck, finally opening into a deep-seated cervical abscess, the opening of which entirely relieved the patient from his suffering. It was necessary to wear a rubber tube drain for several weeks before the pus stopped discharging. Here was another case where a deep-seated pneumatic space outside the usual confines of the mastoid process itself was the seat of infection, and in which the exenteration of the mastoid failed to discover this focus. The pus finally broke into the tissues of the neck under the deep cervical fascia and under the sternomastoid muscle and appeared as a swelling low down in the neck. Nothing appeared in the region of the mastoid process itself. Of course, neither *x*-rays nor any other method of examination can help us very much in this sort of a situation.

CASE II. OTITIS MEDIA IN A CHILD, WITH ABSCESS FORMING BENEATH AND BEHIND THE EAR

This child, aged fourteen months, was referred to me in February, 1918, because of a supposed mastoid abscess. The child had been suffering from severe acute otitis media in both ears for two weeks. The swelling beneath the ear had made its appearance two days before he was sent to me. Examination disclosed a profuse purulent discharge from both ears. The membrane lining the external meatus was the seat of a severe otitis externa. On one side a swelling about the size of a hazelnut appeared below and back of the auricle, just below the region of the mastoid. This swelling resembled, both in its location and appearance, the infiltration described in the case just reported, and, as in this case, there were no changes whatever in the region of the mastoid itself.

A knowledge of the anatomy of the temporal bone at this age excluded at once the possibility of a Bezold mastoiditis, such as was found in the previous case. The diagnosis of an infected lymph-gland was made. Hot boric acid dressings were applied for a couple of days, and when the gland had undergone complete softening a small incision was made through the overlying skin and the contents of the suppurating gland removed with a curet. The child made a prompt recovery.

Swelling over the mastoid develops quite readily in acute otitis media in a child of this age, but this swelling is always located more above and back of the auricle, and never below, as in this case. The reason for this location of a mastoid infiltration in a young child is as follows: There are no mastoid cells in an infant, the antrum being the only pneumatic space back of the tympanum, and this cavity is placed above and back of the attachment of the auricle. There is no mastoid process. For this reason it is, of course, not possible for a mastoid abscess to rupture and form a swelling, as in this case, below the auricle. A suture between the squamous and petrous parts of the temporal bone passes through the outer wall of the antrum. In a young child this suture is still open and blood-vessel communications extend between the membrane lining the antrum and periosteum over the region of the antrum. An acute otitis media in an infant readily causes a swelling back of the ear. When such a swelling develops before the drainage through the drum membrane has been established too much importance need not be attached to the symptom, since, as a rule, the swelling will subside spontaneously after the drum membrane has been opened and drainage from the tympanum established. When a subperiosteal abscess develops back of the ear the condition does not require the extensive mastoid operation that is required in an adult. In many cases the condition heals readily after making a simple Wild incision; that is, an incision through the swelling, cutting through the periosteum. Such an incision in an infant accomplishes the same object as the opening of the antrum in the adult, since with the more or less patulous petrosquamosal suture described above the Wild incision drains the only pneumatic space back of the ear, the antrum. In not a few cases, however, the bony covering of the antrum has undergone softening or has even developed a sequestrum. In such cases the Wild incision will not suffice, but it must be followed by a careful removal of the diseased bone by means of a sharp curet. The difference between the anatomy of the temporal bone of an infant and that of an adult must be kept in mind, else one may cause irreparable injury by an operation in this region in a young child. There is, in the first place, no bony external meatus, the membranous canal being attached to a rim of bone to which the drum membrane is also attached, and which is called tympanic bone. In the second place, the facial nerve does not escape from the bone beneath the tip of the mastoid process as in the adult, for the simple reason that there is no mastoid process in an infant. The opening for the nerve is on

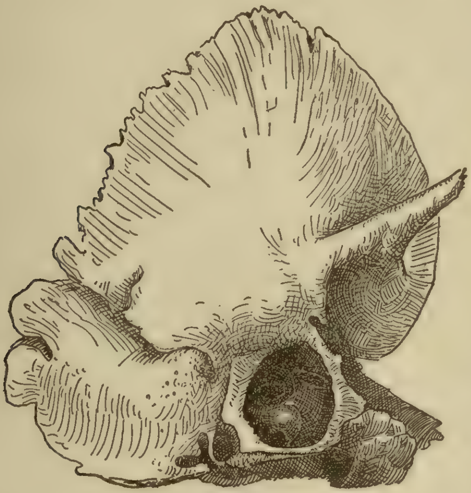

Fig. 211.—Temporal bone of a newborn child. Note the patulent petrosquamosal suture which permits of infection from the antrum, extending directly to the periosteum over to the temporal bone. Note also the absence of a bony external meatus and the relation of the opening of the canal for the facial nerve just below and back of the tympanic cavity.

the outer wall of the temporal bone at the lower posterior angle of the external meatus. An incision over this region might easily sever the facial nerve (Fig. 211).

CASE III. CHRONIC SUPPURATIVE OTITIS MEDIA WITH PROTRUSION OF POLYPS THROUGH A FISTULA FROM THE ANTRUM THROUGH THE UPPER POSTERIOR WALL OF THE EXTERNAL MEATUS

The case is that of a child aged nine, who was brought to me in February, 1918, with a history that she had had a chronic discharging right ear for the last two years. On examining the case I found that the fundus of the meatus was filled with granulations. There was only a moderate amount of discharge from the ear, but this was of a distinctly purulent character and had a very offensive odor. The symptoms were unmistakably those of a process which was invading the bone. I gave instructions to have the ear irrigated twice a day and a solution of boric acid in alcohol dropped in the ear, and asked them to return in a week's time, and for the father to come with the child in order that I might have an opportunity of explaining the situation and getting his consent to the necessary operation. Ten days later the child was brought to my office and appeared quite ill. I found that she had a temperature of 103° F. and had been complaining of a great deal of headache, which was not restricted to the region of the ear especially, but was confined to the right side of the head. Examination of the ear disclosed no alteration in the condition which I had previously seen. The patient was put in the hospital and a more exhaustive examination made. The urine was found to be normal, there was a leukocytosis of 14,000, the child had a distinct congestion over the faucial tonsils, indicating a slight attack of tonsillitis, but we found nothing further in the examinations to account for the temperature except the conditions in the ear. A few days later the patient's temperature had largely disappeared—she still had 99° F. The headaches had practically gone, and she felt in every way very much improved. Examination at this time disclosed a mass of polyps which had broken through the upper posterior wall of the canal and blocked up the external meatus. These granulations had broken through from the antrum, and apparently the rise in temperature was due to the retention of pus behind these granulations. With the formation of an opening into the external canal and the protrusion of the polyps the pain was relieved and the escape of pus was followed by a drop in the temperature. Two days later a radical mastoid operation was performed. A cholesteatoma was found filling the attic, aditus, and antrum. No remnant of the ossicles could be discovered.

The location of the antrum is above and posterior to the external meatus. It does not lie as deep as does the tympanum, but is placed out along the external canal. In cases of acute otitis media with severe reaction in a mastoid process it is not uncommon for a periostitis to develop in the membrane lining the external meatus directly over the region of the antrum. This periostitis will produce a sinking of the upper posterior wall of the bony canal just external to the attachment of the membrana tympani. The significance of such a swelling in the external meatus is exactly the same as that of a periostitis over the surface of the mastoid process back of the ear. The presence of such an infiltration is a well-recognized indication for a mastoid operation, even though there may be no changes over the outer surface of the mastoid process. In such cases if the patient refuses to have the mastoid cleaned out a fistula forms sooner or later in the upper posterior wall of the bony meatus, allowing the pus to escape from the mastoid abscess into the external canal. I have seen this occur in several cases. The end-result will be the same as when a neglected mastoid abscess is allowed to break over the outer surface of the mastoid process. There will be a more or less prolonged discharge of pus which may either finally clear up with the closure of the fistula, or it may be indefinitely prolonged, the process being kept up because of the presence of dead bone in the mastoid.

If we could be sure that every case of acute abscess formation in the mastoid would break externally, either by perforating the upper posterior wall of the external meatus or the outer surface of the mastoid process, the prognosis of acute mastoiditis would be much more favorable than it is in reality. As a matter of fact, the same process of softening of the temporal bone which permits of external rupture of the mastoid abscess may just as readily lead to a rupture internally with the development of an intracranial complication, such as sinus thrombosis, meningitis, or brain abscess. Such complications very often lead to a fatal termination.

In cases of chronic otitis media it is less common for symptoms to develop along the upper posterior wall of the external meatus, just as it is more uncommon for symptoms to develop over the outer surface of the mastoid process. The reason is that in chronic otitis media by a process of osteosclerosis a hardening of the shell of the mastoid takes place, which makes it quite difficult for the disease to make its appearance through an external opening. I have seen chronic mastoiditis result in a rupture through the external meatus in very few cases. The development has always been heralded by the presence of rather persistent severe pain, and has been followed by the protrusion of a mass of granulations into the external meatus. The underlying pathologic process going on in the mastoid process which has led to the erosion of the bony wall has, in the cases observed by me, always been the existence of a cholesteatoma.

It is possible for a chronic mastoiditis with cholesteatoma formation to result in what amounts to a practical spontaneous cure through the development of a fistulous opening into the external meatus which permits of a spontaneous extrusion of the cholesteatomatous masses. Where this spontaneous opening is large enough to permit eventually after the cholesteatoma has been evacuated of the more or less free ventilation of the diseased cavity, the activity of the cholesteatoma becomes very much diminished, that is, the process of erosion of the bony walls as a result of the pressure from the cholesteatoma formation disappears. I have seen a number of just such cases where there is no necessity for any operative interference because there is taking place spontaneously the development of a situation quite similar to that which results from the radical mastoid operation. On the other hand, a cholesteatoma which has resulted in a rupture in the external canal in which the canal remains filled with granulations which interfere with the escape of the cholesteatoma requires the radical mastoid operation.

An interesting complication occasionally presents itself in these cases. If the hearing in the opposite ear is very poor and the patient relies largely upon the affected ear for hearing, one has to be very cautious about performing a radical mastoid operation, inasmuch as this operation is not infrequently followed by very distinct lowering of the hearing function. In cases where the operation for the relief of an active cholesteatomatous process becomes imperative, and where the patient relies upon the affected ear for hearing, I have adopted a modified form of operation, one which removes the upper posterior wall of the canal as far down as the attachment of the drum membrane, but which does not disturb the structures in the tympanic cavity. The plastic operation in the membranous external meatus is carried out exactly as after a complete radical mastoid. The end-results of this modified radical mastoid is by no means as satisfactory as where the complete operation

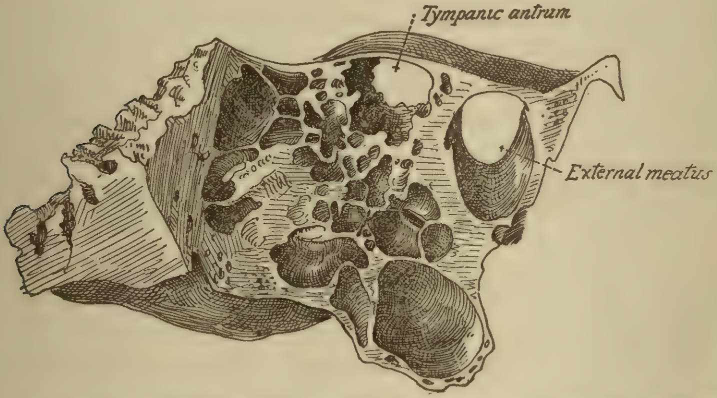

Fig. 212.—Section through mastoid process and external auditory canal showing relation of the tympanic antrum as it lies above and posterior to the external auditory meatus. A pneumatic mastoid process with large cells lying along the periphery and especially at the tip of the mastoid.

is performed. There is likely to be a persistence of discharge even after the operation, even though the operation itself has eliminated the most dangerous element, namely, the erosion of the bony walls of the antrum. There is not infrequently a persistence of discharge after a complete radical mastoid operation, the discharge being due to a patulous eustachian tube with a persistent or recurring infection as the result of a tubal catarrh. No one takes this sort of situation seriously. It is not an element of danger, and does not have the significance which a chronic running ear had before the mastoid operation eliminated the diseased process from the attic, aditus, and antrum. The persistence of moisture through a patulous eustachian tube is not an element of danger, and is, on the whole, of very little annoyance to the patient (Fig. 212).

CASE IV. CHRONIC SUPPURATIVE OTITIS MEDIA COMPLICATED BY AN ACUTE MASTOID ABSCESS—SIGNIFIGANCE OF MARGINAL PERFORATIONS OF THE DRUM MEMBRANE

This case is that of a young man twenty-five years old, with a history of a chronic purulent discharge from the right ear dating from childhood. The patient consulted me March 5, 1918. There had been times when the external evidence of discharge disappeared for a longer or shorter period, but for several years there had been a persistent discharge. On several occasions polyp masses had been removed from the external canal. For two weeks before consulting me the patient had been suffering from very severe pain over the right side of the head. At times only was the pain localized over the region of the mastoid. The physician in charge stated that he had never detected any elevation in temperature nor any symptoms indicating any trouble other than that in the ear.

An examination disclosed no external evidence of trouble over the mastoid process. The region over the mastoid on one side did not show any more tenderness on pressure than that on the other side. In the external canal there was a distinctly purulent discharge with an offensive odor. The perforation in the drum membrane was located in the lower posterior quadrant, was marginal in character, and the region about the opening was the seat of small granulations.

Marginal perforations are usually found in the upper posterior segment or in Shrapnell's membrane. It is unusual to to find such a perforation in either the lower posterior quadrant of the membrana tympani or in the lower anterior quadrant. The significance of a marginal perforation, especially when there is present an offensive discharge, even though this discharge may be very slight, is always an unfavorable sign. The reasons for the serious significance of a marginal perforation are these: In the first place, a marginal perforation means an erosion of the adjacent bony structure, a condition that quite frequently is associated with an erosion deeper in the mastoid—a condition, in other words, which has in it distinct elements of danger from a possible intracranial complication. In the second place a marginal perforation seems to be a necessary factor in the development of the most serious type of chronic otitis media, that is, the type where a cholesteatoma formation exists. A cholesteatoma is formed by the invasion of the middle-ear chambers from the skin lining the external canal. This skin when subjected to the conditions existing in the middle-ear chambers, especially the presence of moisture and a lack of ventilation, begins to exfoliate and eventually fills these cavities with a mass which we call the cholesteatoma. Now the invasion of the middle-ear chambers by the epidermis from the external canal never takes place through a central perforation, no matter how large this perforation may be. The invasion apparently can take place only over the region which is prepared, that is, flattened out, by the erosion of a marginal perforation. Such marginal perforations, as stated above, are located usually in the upper posterior quadrant or in Shrapnell's membrane. I have seen a small marginal perforation in the anterior lower quadrant which led to the formation of a cholesteatoma back in the antrum.

In the case reported here the perforation was small, it was marginal, and there was present an offensive odor to the discharge, as well as granulations, the combination of symptoms which points to a diseased process which is invading the bone—a process, in other words, that is not free from a possible dangerous complication, and, therefore, one which, as a rule, requires the radical mastoid operation. A probe introduced through the perforation led to a fistulous passage extending directly backward toward the mastoid. This fistulous passage appeared to be distinctly deeper than the canal for the facial nerve, which at the level of the floor of the tympanum lies several millimeters external to the internal wall of the tympanum; that is, out along the external meatus.

Because of the history of severe pain the case was operated that same day. The outer shell of the mastoid was sclerosed and thickened, just as we expect to find it in long-standing otitis media. There were no pneumatic cells encountered anywhere in the mastoid. In the lower part of the process we uncovered an abscess cavity the size of a small hazelnut, located very deep and apparently connecting with the tympanum through the fistulous passage described above, which opened in the marginal perforation in the lower posterior quadrant of the drum membrane. The bone lying between the abscess cavity and the antrum, a distance of $\frac{1}{2}$ to $\frac{3}{4}$ inch, showed no evidence of disease. The walls of the abscess cavity were distinctly softened. An examination of the hearing had disclosed the fact that the patient had scarcely any hearing in the right ear, while the left ear was normal. For this reason we did not hesitate to perform a complete radical mastoid operation, which meant the exenteration of the attic and tympanum as well as the mastoid. The ridge for the facial nerve was carefully preserved, although, as stated above, the opening from the tympanum into the mastoid abscess appeared to pass deeper than the facial canal. Only at one time during the operation did there appear to be a possible twitching of the facial. This was when a blunt probe was introduced into the opening in the floor of the tympanum. There was a good deal of oozing when the operation was completed, and for this reason the tampon in the external canal was placed rather firmly. When the patient was seen a couple of hours after the operation he had already come out from under the anesthesia and there was no suggestion of lack of function in the facial nerve. The next morning, however, a distinct but not complete paresis of this nerve was present. Believing that the pressure of the tampon may have had something to do with this, the packing was removed and a looser pack inserted.

It is now but one week since the operation, and the action of the facial nerve remains apparently the same as on the day following the operation. It is not a complete paralysis.

I have seen several cases where a partial (in one case a complete) paresis of the facial nerve followed a day or two subsequent to the operation, and my impression is that the packing or the inflammatory reaction following the operation has been the cause. In none of these cases has the paralysis been permanent. It disappears, as a rule, much more readily than where the nerve has been severed during an operation. The longest case was where the paralysis existed for about six weeks before it had disappeared to the extent that no deformity could be noticed. In one case development of the paralysis took place several days after the operation, and followed in a few hours after a repacking which had been carried out by the intern in order to control what appeared to be rather severe bleeding.

I have also seen facial paralysis develop subsequent to a mastoid operation which was caused by acute infection in the soft tissues of the neck, just below the mastoid. This paralysis also disappeared spontaneously after the subsidence of the inflammatory infiltration.

CASE V. SEROUS LABYRINTHITIS

Mrs. T., aged forty, consulted me first in September, 1913, when she was brought to the Presbyterian Hospital complaining of extreme vertigo, nausea, and vomiting, which had developed ten days previous.

She gave a history of a discharge from the left ear of twelve years' duration. The discharge had never been very great in amount and had caused her no especial annoyance. She did not think that she had been able to hear for some time in the affected ear. The development of vertigo and nausea was associated with distinct sensations of stuffiness in the affected ear. The patient had distinct rotary nystagmus directed toward the normal side. When seen by me the nystagmus was only present when the eyes were turned toward the normal side, and disappeared entirely when they were turned to the affected side.

Examination of the ear disclosed a perforation in the upper posterior margin of the membrana tympani. A mass of granulations protruded from the opening. There was very little offensive odor to the discharge. In testing the function of hearing the right ear was normal, but the whispered voice could not be heard in the left ear. Of course, when one whispered very loudly close to the ear, even with the right ear closed, the patient could hear, but that this hearing came through the normal ear was readily demonstrated by having her close the left ear as well, when it was found that the whispered voice was heard just as distinctly as when the left ear was left open. The tuning-fork applied to the median line of the head always lateralized toward the affected side. This reaction in the Weber test is the characteristic reaction of a deafness caused by obstruction in the sound-conducting mechanism. In labyrinthine deafness in one ear, especially when it is not associated with marked middle-ear trouble, the tuning-fork is usually lateralized toward the normal side.

A very interesting and significant finding in the functional tests was that the hearing was not entirely gone in the affected ear. The a^1 tuning-fork could be distinctly heard in the affected ear. The c^4 tuning-fork was also still heard, but very indistinctly in the affected ear.

The tests were made to ascertain whether a fistula had formed into the labyrinth. Such fistulæ are not uncommon in cases of chronic suppuration and are often present in cases where labyrinthitis develops secondary to chronic middle-ear suppuration. Compression of the air in the external canal will, in the presence of a fistula in the labyrinth, usually suffice to produce enough motion in the endolymph to set up very characteristic responses —development of vertigo and nystagmus. A fistula usually forms in the horizontal canal where this lies exposed in the floor of the antrum. By the compression of air in the external canal slight depression of the granulations covering the fistula can be made which will cause the endolymph to flow from the fistula forward in the horizontal canal toward the vestibule. The result will be the development of a very marked horizontal nystagmus with a quick component directed toward the affected side. Now by reversing the procedure and causing suction in the external canal an endolymph movement from the vestibule across the ampulla of the horizontal canal is produced and a nystagmus directed toward the opposite side now develops. This is the characteristic fistula reaction. No evidence of a fistula was detected in this case.

I made efforts to determine whether any function at all persisted in the semicircular canals. This was done by irrigation of the external meatus with hot and cold water. The responses that we obtain by such methods where the labyrinth is still intact are very characteristic: with cold water irrigation there develops distinct rotary nystagmus, with a quick component directed toward the opposite side; whereas with warm water irrigation a rotary nystagmus develops directed now toward the affected side. In this case no response could be obtained from either hot or cold water.

On September 22, 1913, under a local anesthesia I snared off the granulations protruding into the external meatus.

A very important clinical problem presented itself in this case. Here was a patient suffering from a chronic suppurative otitis media, the type where the temporal bone is distinctly invaded; in other words, a type which does not get well spontaneously and in which there is always present the possibility of a serious complication developing. The patient was suffering from an acute invasion of the labyrinth. An infection of the labyrinth from otitis media is in itself not free from danger. A diffuse suppuration of the labyrinth very frequently leads to an extension through the internal meatus and the development of meningitis or a cerebellar abscess. The milder form of labyrinth infection, which we term "serous labyrinthitis," rarely, if ever, results in a serious complication. In this case it could be determined definitely that the patient still had a remnant of the hearing function in the affected ear. This fact was sufficient to exclude the possibility of a diffuse suppuration of the labyrinth and gave us the diagnosis of a serous, rather than a purulent, labyrinthitis.

A case of chronic purulent otitis media, especially of the type such as this, where the radical mastoid operation is indicated, which develops as a complication a diffuse suppuration of the labyrinth, calls for an immediate operation, and the operation consists of the radical mastoid followed by the exenteration of the labyrinth itself. A radical mastoid operation under these circumstances, which leaves the diffuse suppuration of the labyrinth untouched, is very liable to cause an extension of the labyrinth suppuration to the brain cavity, with a fatal complication. Cases of labyrinthitis of the milder type, that is, cases where there has not been a complete suppression of the labyrinth function, never call for an operation on the labyrinth. There are two reasons for this conclusion: one is that the milder types of labyrinthitis do not lead to an intracranial complication, and the second is that while there is still function in the labyrinth, a greater or less restoration of this function may be expected after the subsidence of the acute reaction.

In the case under discussion the clinical indications for a radical mastoid operation existed, but an operation upon the labyrinth itself was contraindicated. It seemed unwise to proceed immediately with the mastoid operation in the presence of the acute labyrinthitis, so we kept the patient in the hospital for ten days until the vertigo had largely disappeared, when she was sent home.

The patient returned on October 20th. She was still annoyed from the disturbance of equilibrium. The functional examination of the ears disclosed the same findings as the first examination. There was no spontaneous nystagmus, but the patient was still able to hear in the affected ear. The radical mastoid operation was performed, from which the patient made an uneventful recovery.

We had an opportunity of examining the patient in October, 1917, and found that the affected ear responded readily to caloric stimulation. This was carried out not by irrigation of the ear, as this might very easily set up a discharge, but by driving a stream of compressed air into the external canal. The patient very promptly developed nystagmus, directed, with a quick component, to the opposite side. The hearing tests were of especial interest: the patient not only heard the whispered voice—indistinctly, of course—but was able to hear all of the tuning-forks. One peculiar phenomenon observed in her case was that all of the forks below the c^4 were heard as a different pitch than in the normal ear. This is known as diplacusis, and when present it always indicates some trouble in the internal ear. The phenomenon is produced by deposits of some sort on the vibrating mechanism in the labyrinth; that is, the mechanism which responds in sympathetic vibrations to tones from the external air. This vibrating mechanism in the labyrinth we believe to be the membrana tectoria. Different parts of this membrane respond with sympathetic vibrations to tones of different pitch. The same part must always respond to the same tone, otherwise the patient has difficulty in recognizing the pitch of a tone. Now anything which weighs down this vibrating mechanism, as, for instance, a fibrin deposit, such as might easily happen in the presence of a serous labyrinthitis, would cause the segment so weighed down to respond to a different tone than it would normally, and thus produce the phenomenon known as diplacusis.

CASE VI. EMPYEMA OF THE MAXILLARY SINUS

Mr. C. M. (Fig. 213), age twenty-nine, was referred to me in February, 1917. His complaint was purulent secretion from the left side of the nose, of which he has been conscious for several years. He had suffered a good deal from frontal headache in the region of the left frontal sinus and had been advised several times to have an external operation on the left frontal sinus.

Examination of the nose disclosed pus oozing out from under the middle turbinal body on the left side. Transillumination showed a shadow over the left maxillary, but the right maxillary and both frontal sinuses appeared clear. Irrigation of the left maxillary sinus by the introduction of a Killian tube in the middle meatus washed out a large amount of foul-smelling pus. Irrigation of the left frontal sinus disclosed no evidences of disease.

On February 7th, under local anesthesia, the middle turbinate body was removed and a large opening made into the maxillary sinus through the middle meatus.

The patient was seen again on February 13th, when the odor and secretion had disappeared. On May 7th the patient was again examined, when the sinus was still found free from secretion. In making the transillumination test the shadow over the maxillary sinus still persisted. The annoyance from frontal headache had disappeared.

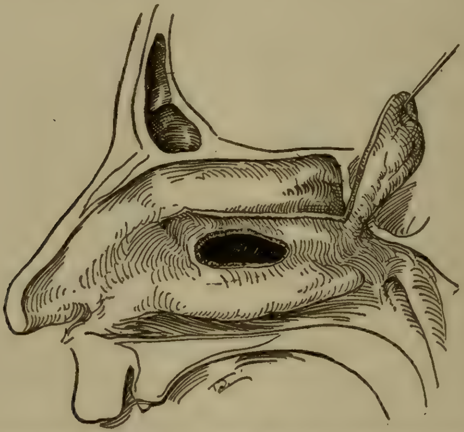

Fig. 213.—Section through the nose, showing the lateral wall. Middle turbinated body elevated. Opening in the middle meatus through the nasal fontanel into the maxillary sinus.

The case is especially interesting because of the symptoms over the frontal sinus, whereas the maxillary sinus was the seat of the trouble. This is not at all an uncommon condition. The case emphasizes the importance of not attempting to make a definite diagnosis of frontal sinus infection from the presence of frontal sinus pain and the discharge from the nose.

CASE VII. ABSCESS OF THE SPHENOID SINUS

The case is that of a man aged forty-eight, who consulted me January 15, 1918, complaining of persistence of severe frontal headache, coming on early in the morning and lasting, as a rule, for a couple of hours, sometimes persisting most of the day. The trouble developed early last October, and he does not recall that its development was associated in any way with nasal symptoms or symptoms of a head cold. During the past six weeks there has developed, in addition to the frontal pain, severe pain in the region of the occiput. Neither the frontal nor the occipital pain was lateralized. The patient has not been able to work since the onset of this trouble. He had a sallow, haggard look, and had an appearance which suggested serious illness. The case had been treated as one of suspected frontal sinus infection, although no operative measures had been carried out. Inspection of the nasal passages convinced me at once that there was no trouble in either the frontal or maxillary sinuses, for the reason that there were no evidences of any changes whatever in the mucous membrane of the middle meatus; that is, the space lying under the middle turbinated body. Into this space opens three of the nasal accessory sinuses, the maxillary, the frontal, and the anterior ethmoid cells. Any infection of one or more of these sinuses produce, as a rule, very characteristic changes in the mucous membrane, which presents itself at the mouth of the middle meatus. The membrane is swollen, edematous, congested, and usually, at least after the application of cocain which results in shrinking of the tissue, purulent matter appears under the middle turbinal body. In this case there was no difficulty in inspecting the middle meatus on both sides, and on neither side was there any change whatever suggesting infection of the anterior series of nasal sinuses. After cocainizing the membrane of the nose by means of a cotton applicator, using a 1 per cent. solution, I soon discovered that on the left side there was a suspicious appearance of the mucous membrane lining the space between the middle turbinated body and septum. The membrane had an edematous appearance, was swollen, and even after prolonged application of 1 per cent.

cocain solution could not be reduced so that it was possible to inspect this passageway. This space between the middle turbinal and the septum is known as the common meatus of the nose, or the olfactory space. It is also sometimes referred to as the superior meatus. The term "superior meatus," however, is technically applied to another region more restricted. After applying cocain in the manner described above the patient was placed with the head forward and allowed to remain quietly for ten minutes. When I saw him again I found that he had saturated his handkerchief with secretion which had been pouring from the left side of the nose. Inspection disclosed a quantity of creamy pus coming down between the middle turbinal and the septum. Skiagraphs made of the head showed the antrums normal, frontal sinuses small, but no evidence of trouble in these sinuses. A very interesting condition was found in the sphenoid sinus. Instead of the sharply defined outlines of this sinus, the open space was obliterated, and the outline shaded off imperceptibly in the surrounding structures.

The man had suffered so much during the four months of his illness and was so hypersensitive that it was hard to persuade him to have an operation on the nose. He was prepared by giving him $\frac{1}{4}$ grain of morphin hypodermically, with atropin, fifteen minutes before time to operate. The nasal passage on the left side was thoroughly cocainized, using a 5 per cent. solution of cocain made up in 1 : 5000 adrenalin solution. Pledgets of cotton saturated in this solution were pushed in between the middle turbinal body and the septum, and the region of the middle turbinal itself was treated in the same way. These cotton pledgets were removed at the end of ten minutes, but still there was by no means the complete cocainization which one gets in most cases where this method is used. The operation consisted in the removal of the middle turbinated body as a preliminary step. This was done by making an incision $\frac{1}{2}$ inch deep along its attachment at the anterior end. The loop of a wire snare was then passed over this part of the turbinated body, and the whole structure drawn out of the nose, pulling it loose from its attachment. With a suitable nasal forceps the posterior half of the ethmoid labyrinth was exenterated and the anterior wall of the sphenoid sinus freely exposed (Fig. 214). Very little difficulty was experienced in removing the anterior wall of the sphenoid sinus or a large part of this wall by means of a sphenoid sinus bone forceps. This part of the operation occasioned considerable pain, but the whole operation did not last more than a couple of minutes, as we were not retarded because of any severe hemorrhage. The material which escaped from the sphenoid sinus showed inspissated, white colored, crumbly masses, which suggested the appearance of the secretion which one washes out from cases of chronic otitis media

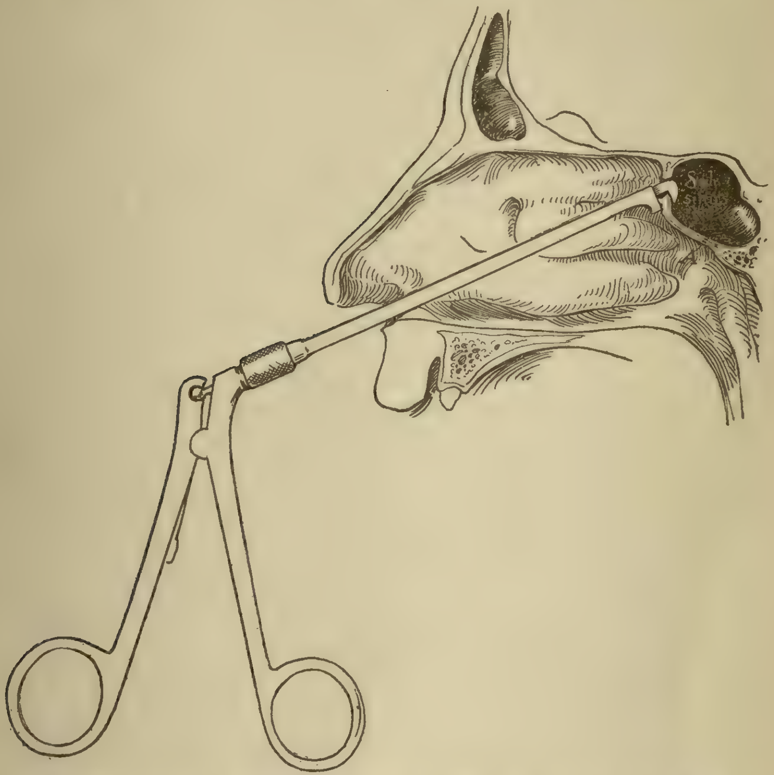

Fig. 214.—Section through the nose, showing the normal opening of the sphenoid sinus, and the bone forceps in place for the removal of the anterior wall in the operation for the cure of chronic empyema of the sphenoid.

where a cholesteatoma is present. An unusually large sphenoid sinus was uncovered. It was not found necessary to introduce any nasal packing. The patient remained in the hospital for a couple of days. At the end of this time his headaches had entirely disappeared. No subsequent treatment was carried out. The patient was seen again on February 9th. Examination at this time disclosed no evidence of any sinus trouble. The pathologic conditions had entirely cleared up. His headaches had disappeared and the patient's general condition had again become normal.

Infection restricted to the sphenoid sinus in which other nasal accessory sinuses are not involved is rather the exception. One sees a great many cases of acute nasal infection where several of the nasal accessory sinuses are involved. In this case the disease was found in the posterior ethmoid cells as well as in the sphenoid. The operation for the relief of an empyema of the sphenoid is, on the whole, less difficult than that of the frontal sinus, but more difficult than an intranasal operation on the maxillary sinus. The risk of such an operation lies usually in failure to appreciate the anatomic surroundings. If one attempts to break through the anterior wall of the sphenoid by use of a curet there is great risk that when one enters the sinus the end of the instrument will cross the sometimes narrow space and break through the rather fragile upper posterior wall. Such an accident is likely to be followed in a couple of days by meningitis. The treatment of a sphenoid sinus disease severe enough to call for an operation is the same as that for any of the nasal accessory sinuses. The first thing is to secure ample ventilation. Irrigations, topical applications of medicated solutions, etc., are entirely unnecessary. Exception should be made, however, for cases where granulations spring up around an opening which has been made. These granulations sometimes require reduction by the use of silver nitrate solution.

CASE VIII. CHRONIC EMPYEMA OF THE MAXILLARY SINUS; OPERATION, SEVERE HEMORRHAGE, PACKING, SYSTEMIC INFECTION, AND THROMBOSIS

This case was that of a man aged forty, who consulted me in September, 1917, complaining of symptoms of general muscular rheumatism which had been annoying him for a couple of years. He had had the tonsils removed a year and a half before, and at the same time had an infected upper wisdom tooth on the right side removed. This extraction had been followed by acute symptoms over the right maxillary sinus, with a profuse purulent discharge from the nose. These symptoms of sinus disturbance have never entirely disappeared.

On examining him I found that there was a deep shadow over the right maxillary sinus, but the other sinuses remained clear. The sinus was punctured through the middle meatus and irrigated. The characteristic foul-smelling discharge usually found in chronic maxillary sinus empyema was washed out. Because of the chronic nature of his trouble, and the fact that he was suffering from symptoms of a systemic infection for which no other active focus was discovered, it was decided to operate upon the right maxillary sinus. The operation was performed under local anesthesia, the middle turbinal body was removed, and an opening made in the middle meatus. It is important to make the opening large enough to provide free ventilation of the sinus. In order to cure a chronic case such an opening must be $\frac{1}{2}$ to $\frac{3}{4}$ inch long and from $\frac{1}{4}$ to $\frac{1}{2}$ inch broad. In such an opening there is no danger of spontaneous closing, and the only cases of chronic empyema which do not appear to recover completely after such an operation are the exceptional cases where there is some necrosis of the bone. One must be careful in operating not to cut too far forward, because there would be risk of injuring the tear duct. In this case, while making an effort to enlarge the opening posteriorly, a rather large artery was injured, and a very profuse hemorrhage resulted. A strip of gauze was quickly packed in the nose, but this did not suffice, and a second effort had to be made in a few moments because of the persistent profuse hemorrhage. This gauze was tamped very firmly upward and backward toward the sphenoid. Because of the profuse hemorrhage we did not risk removing the tampon completely the next day, but only loosened it partially. The following day the entire remaining strip of gauze was removed. The patient was quite weak from the loss of blood, developed a temperature of 102° F., and for these reasons was kept in the hospital for eight days. No subsequent hemorrhage occurred while in the hospital. At the end of eight days the patient was allowed to go home, though he was still feeling quite weak. The second day after his return, while sitting at the breakfast table, he experienced a sudden profuse hemorrhage from the nose, which stopped in the course of twenty minutes, spontaneously. A physician did not reach him for a couple of hours. In the meantime he had experienced another profuse hemorrhage. The nose was packed again, which was removed in twelve hours. Shortly after this he developed a chill and a temperature ranging as high as 106° F., and for a few days ran the typical septic temperature with chills characteristic of thrombosis. At the same time a swelling in the calf of the right leg developed. This formed into an abscess which later had to be opened. The patient eventually made a complete recovery. I saw him the latter part of February, 1918. The opening of the maxillary sinus was still present. There was no discharge from the nose and irrigation of the sinus showed the cavity to be clear from disease.

The packing of the nose after an operation for suppurating sinus is to be avoided wherever possible. In a case of this sort, where the hemorrhage was very severe, packing cannot be avoided. The ulceration of the nose which followed the pressure of the gauze was very likely responsible for the secondary hemorrhage, as well as for the septic infection and thrombosis.

CASE IX. FRONTAL SINUS INFECTION

The patient is a woman of sixty-two, who consulted me October, 1917, complaining of headaches, which came on daily and had been bothering her for six weeks. The pain was located definitely over the region of the left frontal sinus. The onset of the trouble had not been preceded by the symptoms of a head cold, which usually precede an acute sinus trouble. In an examination of the nose I failed to discover the slightest change in the membranes about the opening of the nasofrontal duct which would suggest frontal sinus infection. The patient had none of the nasal symptoms which usually go with sinus trouble, such as increased unilateral nasal discharge and those symptoms which are associated with congestion of the membranes of the nose, chiefly the symptom of nasal obstruction. The opening of the frontal sinus into the nose is under the middle turbinated body. In this case the middle turbinated body was small, and we had little difficulty in inspecting the middle meatus, that is, the space between the free edge of the middle turbinal body and the outer nasal wall. It is so unusual to find persistence of a frontal sinus trouble without local evidences in the membrane lining the middle meatus that I was at first inclined to suspect a neuralgia of the supra-orbital nerve rather than a true accessory sinus trouble. The region of the left frontal sinus was distinctly sensitive to pressure—a condition which would be found as much in a case of frontal neuralgia as it would in a case of frontal sinus infection. In making a transillumination test of the nasal sinuses the maxillary sinuses were shown to be quite clear and the right frontal sinus was quite clear, while in the region of the left frontal sinus there was a distinct shadow. The transillumination test for accessory sinus trouble has its limitations. These limitations are more clearly defined in the case of the frontal sinus than in that of the maxillary. In most of the cases where there is no maxillary sinus infection the transillumination gives us definite information as accurate as does the skiagraph. Wherever the light shines through clearly and equally as it does in most cases of normal maxillary sinuses there can be no doubt regarding the condition of these cavities, and a skiagraph adds nothing of value in making the diagnosis. It is only in cases where the transillumination throws a shadow on one or both sides that we are left in doubt. Such a shadow frequently is due to very much thickened bony structures, and not to any pathologic conditions in the sinus. In these cases the skiagraph is of assistance, as the x-ray will show very definitely when the sinuses are filled up with pathologic conditions. In the case of the frontal sinus, transillumination leaves us more frequently in doubt, due chiefly to the frequent occurrence of anatomic variations in the size of this sinus. After all, however, in most of the cases where there is no frontal sinus trouble the transillumination gives us an entirely satisfactory answer. Where both sides light up clearly and equally there can be scarcely a doubt regarding the existence of normal conditions. The failure of the frontal sinus region to light up on transillumination may be due to a pathologic condition in a sinus, but it may also be due to either a small frontal sinus with thick bony walls or complete absence of a frontal sinus. The latter condition is by no means uncommon. In the case under discussion the transillumination showed a distinct shadow on the left side, which was not present on the right, and it is in just such cases as this that the skiagraph is of great assistance. The skiagraph shows at once the size of the sinuses and, what is more, a well-made skiagraph will give very accurate information as to whether the sinuses are normal or whether they are the seat of pathologic changes. In this case the left frontal sinus was found to be a well-developed sinus fully as large as the one on the right. A distinct shadow in the skiagraph over the left frontal sinus showed that the sinus was filled with some pathologic condition. Because of the age of the patient, and she being rather frail, I was very anxious to avoid any operative procedures. I tried to relieve the retention of secretion in the frontal sinus by applications of $\frac{1}{2}$ per cent. cocain, made up in 1 : 5000 adrenalin, to the membranes lining the middle meatus. This was repeated on four different occasions during the month of November, but at no time did I succeed either in securing drainage from the frontal sinus or in relieving the discomfort. The patient found that by taking 10 to 15 grains of aspirin the discomfort was made very much more bearable, but by December 1st she had reached the conclusion that she would prefer to have me attempt to relieve the condition by an intranasal operation. This operation I undertook under local anesthesia. The anterior half of the middle turbinated body was removed, and the anterior ethmoid cells cleaned out, so as to give us freer access to enlarge the nasofrontal duct (Fig. 215). I had never been able in this case to introduce a probe into the frontal sinus, but after the removal of the anterior part of the middle turbinal body and exenteration of the anterior ethmoid cells I found no difficulty in introducing a probe into the sinus. With a frontal sinus rasp this opening was made larger. Because of the bleeding I was unable to detect any evidence of discharge from the frontal sinus. The

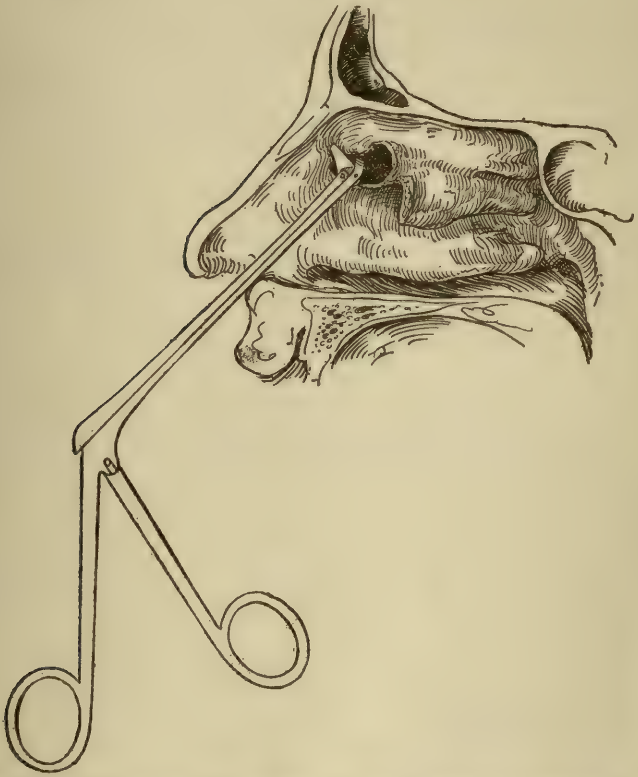

Fig. 215.—Lateral wall of the nose. Anterior part of middle turbinated body removed. Bone forceps in position, removing anterior ethmoid cells in order to secure better drainage from frontal sinus.

operation had to be done very quickly, as the patient was not strong. After the operation there seemed to be very little immediate relief in the discomfort in the region of the frontal sinus. No effort was made to treat the case for some time—in fact, not until the reactions following the operation had completely subsided. Four weeks after the operation I introduced for the first time a cannula into the frontal sinus and washed out a quantity of thick gluey pus. The relief which followed this procedure was very distinct. I saw the patient again two weeks later. The symptoms of soreness over the frontal sinus had practically disappeared. The sinus was irrigated, but no secretion washed out. The shadow on transillumination was still quite distinct. This shadow was due to the thickening of the membrane lining the sinus. The patient was seen March 1, 1918. She was quite free from symptoms. A probe could be readily passed into the frontal sinus, and transillumination disclosed no trace of a shadow.

CASE X. CHRONIC ABSCESS IN THE TONSIL FOSSA FOLLOWING OPERATION FOR ENUCLEATION OF THE TONSILS

This case is that of a woman aged forty-five, who gave a history of long-standing tonsil trouble, consisting of recurring attacks of acute tonsillitis and annoyance from accumulation of cheesy plugs in the tonsil crypts. Patient had never had quinsy sore throat. The last attack of acute tonsillitis was seven years ago. Patient has had symptoms of general muscular rheumatism characterized by soreness and stiffness of muscles, especially about the shoulders and arms, since she was twenty years of age. For two or three years has had a distinct arthritis in the right knee, and for the past year has been developing an arthritis in the terminal joints of both little fingers. The terminal joints of all the fingers are somewhat tender and stiff, but only the little fingers show any distinct swelling.

Because of these general symptoms and the conditions found in the tonsils the patient had had an operation for enucleation of the tonsils under local anesthesia October, 1917. Two weeks after the operation the throat appeared to be entirely healed.

About that time she began to notice a swelling in the fossa of the left tonsil. This swelling enlarged to about the size of a hazelnut, when it ruptured spontaneously and discharged pus. The condition has persisted ever since, although several efforts have been made to correct it. The swelling has been freely incised and the cavity cureted.

Iodin has been also injected into the abscess cavity. When the patient was seen by me the first of last October in the fossa of the left tonsil at the junction of the middle and upper thirds was a swelling about $\frac{3}{8}$ inch in diameter, showing only a moderate elevation. The region about this swelling was distinctly congested, and by pressure pus was expressed through a small fistulous opening. The patient states that she experiences acute exacerbations of this trouble, when there is marked soreness in the throat and distinct increase in the purulent discharge. In discussing the situation with the doctor who had removed her tonsils, and who had taken care of the throat subsequently, he was under the impression that the trouble lay outside of the tonsil, perhaps from a lymphatic gland which had become infected. It was apparent that the correction of the difficulty meant a careful dissection which would remove the walls of the abscess cavity. This was accomplished under local anesthesia. A probe provided with hooks at the point was introduced into the opening, and the diseased tissue pulled out into the pharynx. The diseased mass was then dissected out. It was found to consist of a small mass of tonsil tissue which had become enmeshed in the scar tissue after the first operation. This complication one meets with occasionally after the tonsils have been apparently successfully enucleated. At one point or another a fragment of lymphoid tissue has been overlooked, and when such fragments are left they are very prone to become the seat of a persisting infection and especially likely to cause systemic trouble. In this case the rheumatic symptoms improved very markedly a month after the operation. Persistent infection in the pharynx after removal of the faucial tonsil is more often found at the lower pole where the faucial tonsil joins the lingual tonsil. In this region there is no sharply defined demarcation between the faucial tonsil and the lingual tonsil, and for this reason it not infrequently happens that lymphoid tissue at the base of the tongue grows up and occupies the region formerly occupied by the lower half of the faucial tonsil. Fragments of tonsil tissue left in this region may become the seat of a persisting infection capable of causing systemic trouble. For these reasons we take pains to remove as much of the lymphoid tissue as is feasible at the lower part of the tonsil at the time the tonsils are enucleated. In spite of this precaution cases occasionally present themselves where a focus of infection persists in this region.

CASE XI. SINGER NODULE ON THE VOCAL CORD

Mr. J. M. T., age forty-four, consulted me in February, 1917, complaining of hoarseness, which had been annoying him more or less for several years and which always became more troublesome after using his voice. He was not a professional singer, but did a great deal of public speaking, and for this reason suffered a good deal of inconvenience from the handicap caused by his hoarseness. There were no other throat symptoms. He was not subject to tonsillitis. He has been a victim of hay-fever for a number of years. At the time I saw him first he was suffering from an acute head cold, complicated by an acute

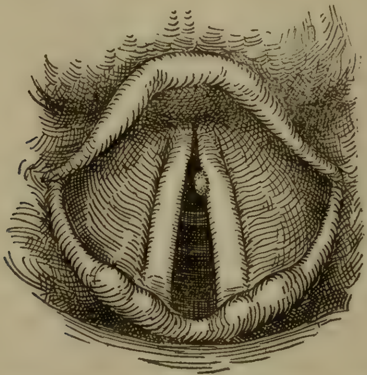

Fig. 216.—A view of the larynx, showing the nodule on the left vocal cord.

infection in the right maxillary sinus. Aside from this the conditions in the nose and pharynx appeared normal.

In the larynx both vocal cords showed a slight congestion. On the left cord there was located a soft nodule quite distinctly circumscribed and measuring 2 mm. in diameter. This nodule took its origin from the mesial aspect of the cord at about the junction of the middle with the anterior third (Fig. 216).

The inspection of this part of the larynx by means of the laryngoscopic mirror was rather difficult, owing to the fact that a rather short frenum of the tongue made it difficult to pull the tongue out forcibly enough to draw the epiglottis forward. After cocainizing the throat with 5 per cent. solution of cocain swabbed on the surface of the soft palate and the posterior wall of the pharynx I succeeded, by the indirect method, in removing the nodule with a laryngeal forceps devised for this purpose. The patient was given directions to be very cautious about the use of the voice for ten days.

When the patient was seen a couple of months after the operation the left cord was still slightly thickened and more congested than the right, but the difficulty with the hoarseness had in a large measure disappeared.

CASE XII. CARCINOMA DEVELOPING ON THE TRUE VOCAL CORD

Mr. H. G. D., age thirty-four, consulted me in March, 1917. His sole complaint was that of hoarseness, which began to develop the previous October. It came on insidiously and gradually became more marked until six weeks ago, when without any recognized cause the hoarseness became very much worse. It was not associated with any local discomfort. He had never been troubled with cough and his general health did not seem to be impaired. The man looked robust and in good health.

In making an examination of the respiratory passages the nasal passages on both sides were somewhat constricted as the result of anatomic variation. The faucial tonsils were somewhat enlarged and showed distinct evidences of chronic infection, consisting of congestion and large cheesy plugs in the crypts. The patient gave a history of recurring attacks of acute tonsillitis. The postnasal space was normal. Both vocal cords were moderately congested. On the left vocal cord, at the junction of the middle with the posterior third, was a rather circumscribed infiltration, the posterior margin of which was sharply defined. The posterior third of the cord was normal in appearance. The infiltration extended anteriorly, gradually diminishing until it reached the anterior commissure. The surface of the infiltration was roughened and showed distinct ulceration and was covered with yellowish secretion. The movement of the vocal cord was not interfered with. The appearance of the lesion suggested rather a tuberculous process. Careful examination of the chest by an internist discovered nothing very characteristic of a tuberculous lesion. There was no expectoration of mucus, so that an examination for tubercle bacilli could not be made. A Wassermann test was negative. The patient was advised not to use the voice above a whisper and to report back for observation. A general régime was adopted, as though he were suffering from incipient tuberculosis. Under this treatment the patient gained in weight, but the local condition in the larynx became more troublesome.

During my absence from the city in August the patient was under the care of Dr. Boot. At that time there was decided increase in the infiltration in the larynx, and a small section of the tumor was removed and a histologic examination made by Dr. A. M. Moody, who diagnosed the condition as carcinoma.

I saw the patient again the first week in September. The infiltration had become much more extensive and was causing some difficulty in respiration. The opposite vocal cord appeared unaffected and there was no glandular involvement of the neck. The situation, with the histologic findings, was placed before Dr. Arthur Dean Bevan, who removed the left half of the larynx. Examination of the tissue removed proved beyond any question the existence of a carcinoma. The patient was seen last on November 1st. He was feeling well and had completely recovered from the operation. His voice is about as it was before the left half of the larynx was excised.

It is, of course, too early to determine whether there will be a recurrence. Carcinoma of the larynx extends very late to the neighboring lymphatics, and for this reason removal of the affected part offers a better prognosis than in cases of carcinoma in most regions.

CASE XIII. CYSTIC FIBROMA OF THE NASOPHARYNX

Boy, age fourteen, whose complaint was nasal obstruction which had annoyed him only during the past year. Was seen by me May 1, 1917.

Examination of the nose disclosed conditions which might very easily be a factor in causing nasal obstruction, as the septum had a pronounced ridge projecting toward the left. The fact that his annoyance came on only during the past year suggested at once some other cause, since there was no history of trauma which might account for the recent development of the deflected septum. Deflection of the nasal septum and spurs of the septum are very common occurrences. One might almost say that it is exceptional to examine a nose where there does not exist some irregularity of the nasal septum. An irregularity of the septum which requires correction surgically is, however, very unusual. A great deal of undue importance has been given to the irregularities of the septum, both as a cause for nasal catarrh and as a cause for ear trouble. A safe rule to follow in deciding whether a deflected septum needs correction is to find out whether the patient is annoyed by symptoms of nasal obstruction which cannot be accounted for in other ways. In this case an examination of the postnasal space disclosed the real cause for the symptoms of nasal obstruction. The mucous membrane of the posterior wall of the pharynx was found to be covered with a thick tenacious mucus, and by means of a postnasal mirror the postnasal space was found to be occupied by a round mass the size of a hickory nut, the surface of which had a distinct grayish color. The growth was located somewhat more toward the left. The rounded appearance of the growth and the color excluded the probability of a sarcomatous growth. It was clearly not a mucous polyp, and a diagnosis of postnasal fibroma was made.

There are various ways of extracting these postnasal growths. One is by introducing a snare through the nose. In this case the growth was removed through the mouth. It was necessary to cocainize the soft palate and posterior wall of the pharynx. A retractor for the soft palate was then placed in position. The growth was readily seized with the postnasal forceps and dragged from its attachment. It proved to be a cystic fibroma.

The hard fibromas in this region are occasionally encountered and are rather difficult to remove, and their removal may be followed by very serious hemorrhage. A case of this kind, on which I operated a couple of years ago, resulted in primary hemorrhage so severe that it was necessary to apply immediately a postnasal tampon.

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